THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXII. No. 2087.] LONDON, MAY 12, 1903. [55TH YEAR. PRICE 6d.

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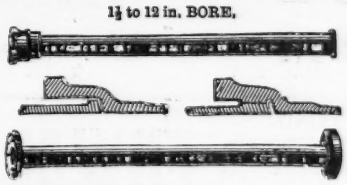

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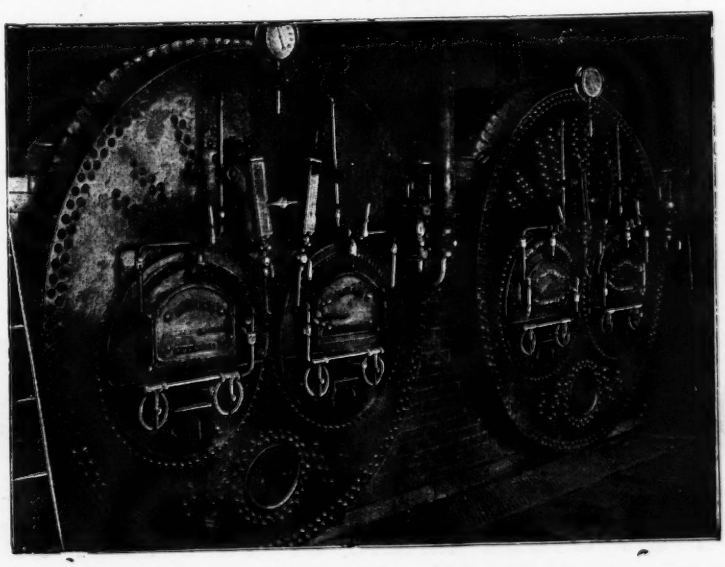

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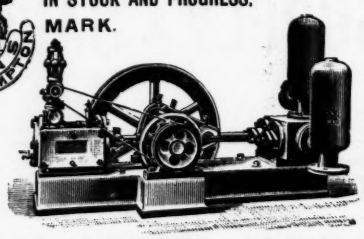

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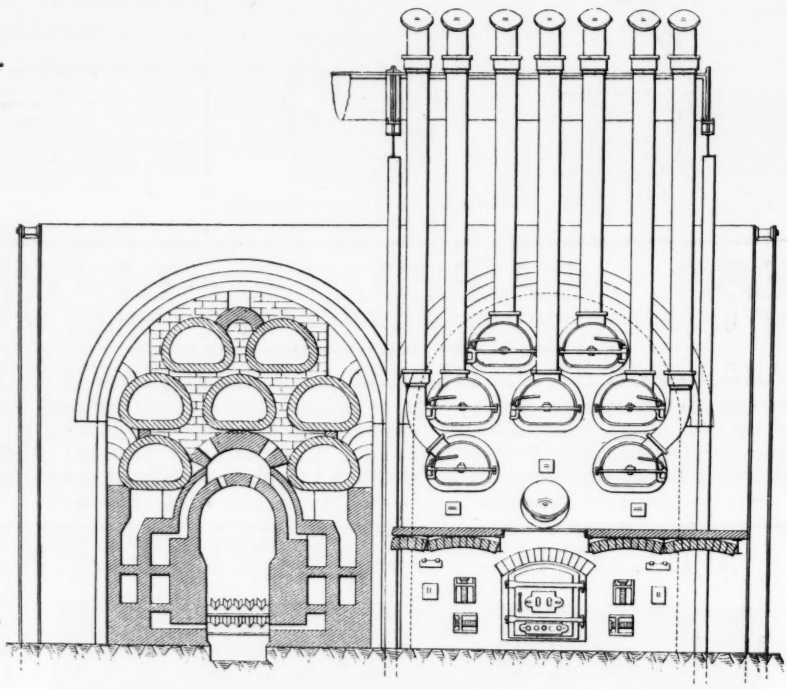

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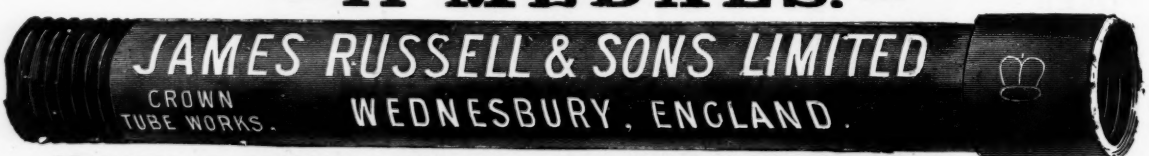

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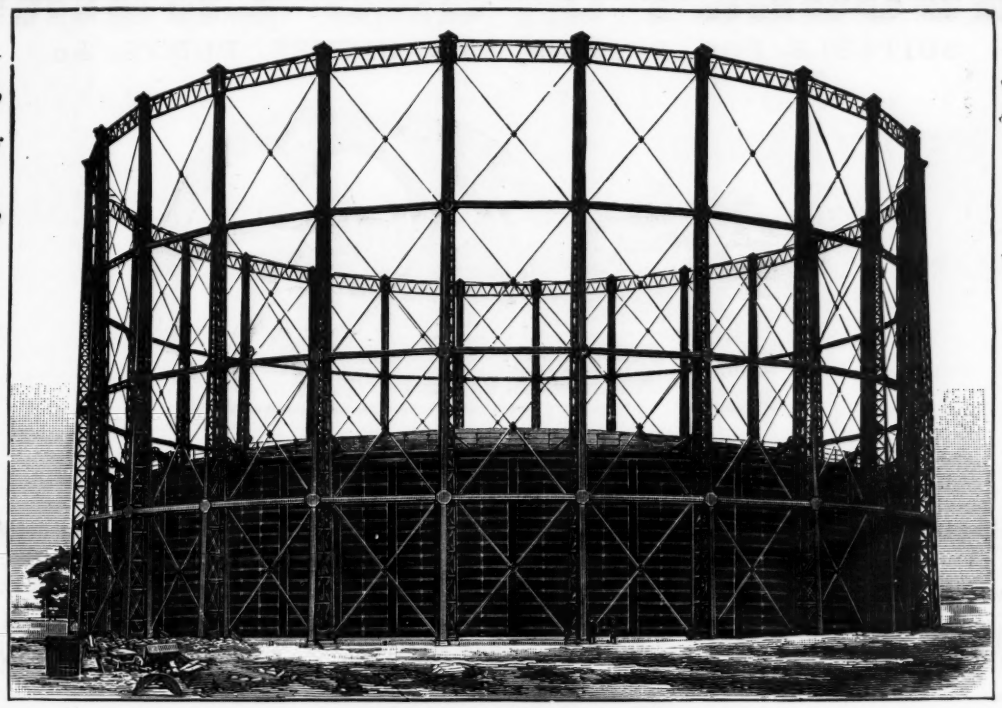

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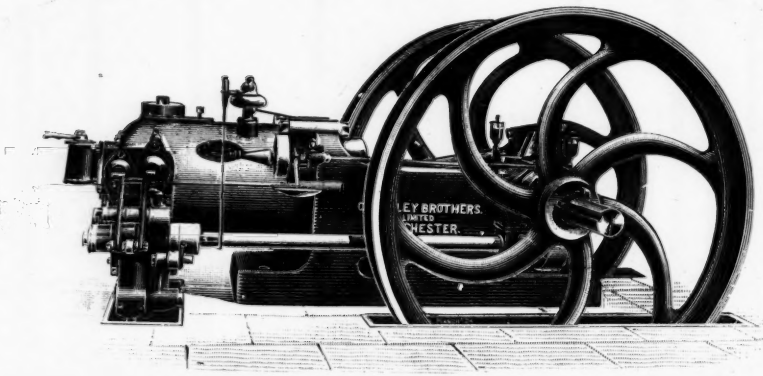

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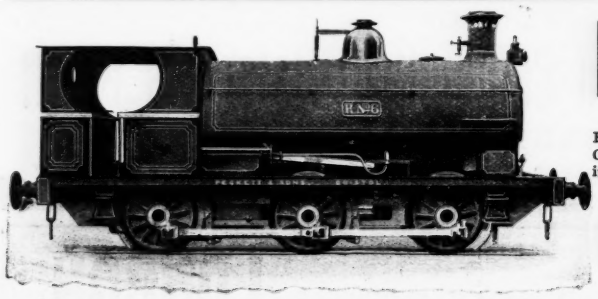

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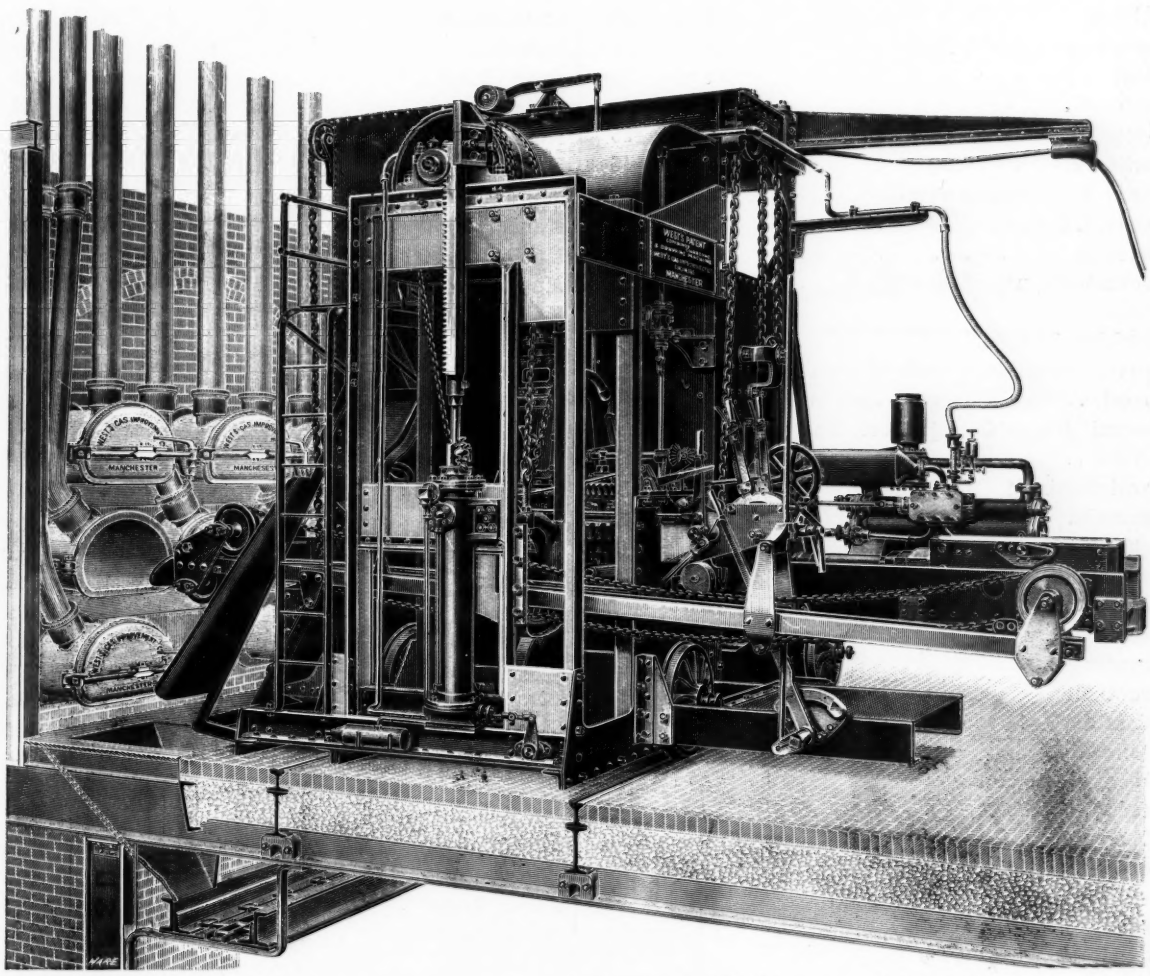

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Aalborg	6	54	Ludwigshafen	16	144
Barcelona	14	126	Lübeck	4	35
Basel	11	99	Lynn (U.S.A.)	5	45
Berlin II.	14	126	Malaga	6	54
Berlin III.	15	135	Malmoe	12	108
Berlin IV.	24	216	Mariendorf, Berlin, I. C. G. A.	32	288
Berlin V. (Schmargendorf)	20	180	Mannheim	6	54
Berlin, I. C. G. A.	46	414	Mainz (Maintz)	7	63
Bielefeld	8	72	Muelhausen i. Els.	10	90
Bockenheim, near Frankfort	29	261	Muehlhausen i. Th.	4	36
Bremen	30	270	Mailand (Milan)	24	216
Brooklyn (U.S.A.)	5	45	München-Gladbach (Munich)	8	72
Brüssel (Brussels)	8	72	Pest (Pesth)	15	145
Cassel	17	153	Pest Mineralölfabrik	1	3
Central Union Gaslight Co., New York	6	54	Posen	6	54
Charlottenburg	32	288	Plauen i. Voigtl	6	54
Chemnitz	27	243	Odense	9	72
Coblenz	13	117	Randers	4	36
Darmstadt	12	108	Remscheid	3	27
Danzig	20	180	Rostock	6	54
Dresden II.	14	126	Rixdorf	12	108
Dresden III.	10	90	Stettin	21	189
Drontheim	2	18	Stockholm	24	216
Düsseldorf	8	72	Strandvej	4	36
Esslingen	3	27	Trieste	18	162
Elberfeld	5	45	Winterthur	8	72
Frederiksberg	27	233	Witten	4	36
Flensburg	6	54	Wittkowitz	4	31
Gera	9	81	Wien (Vienna)	186	1674
Genf	7	63	Zürich	32	288
Göttingen	10	90	Berlin-Tegel	40	360
E. & J. Gutmann, Wien	2	6	Nürnberg	32	288
Haag (The Hague)	9	81	Plymouth	8	72
Haarlem	12	108	St. Gallen	6	54
Hamburg, Billwärder	24	216	Enschede	8	72
Heilbronn	10	90	Total	1144	10,263

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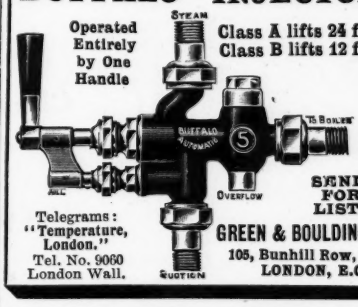

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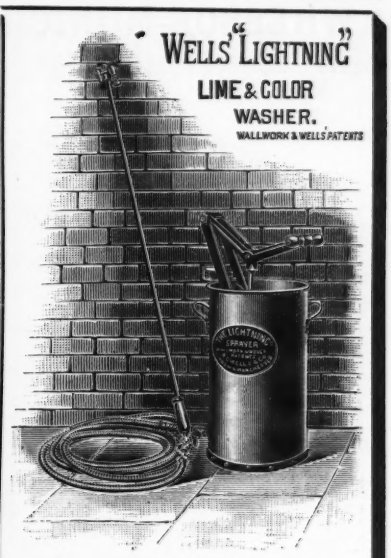

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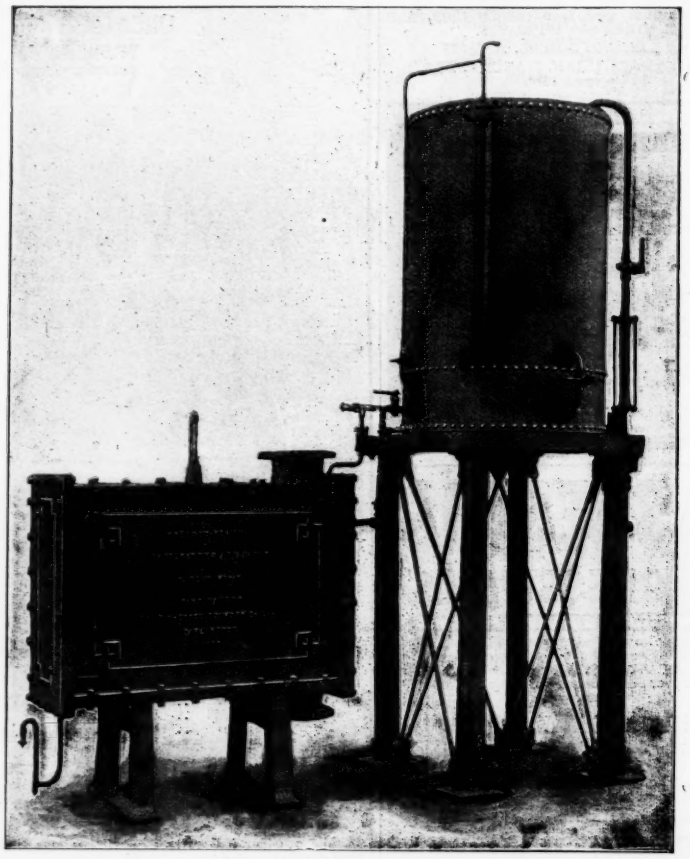

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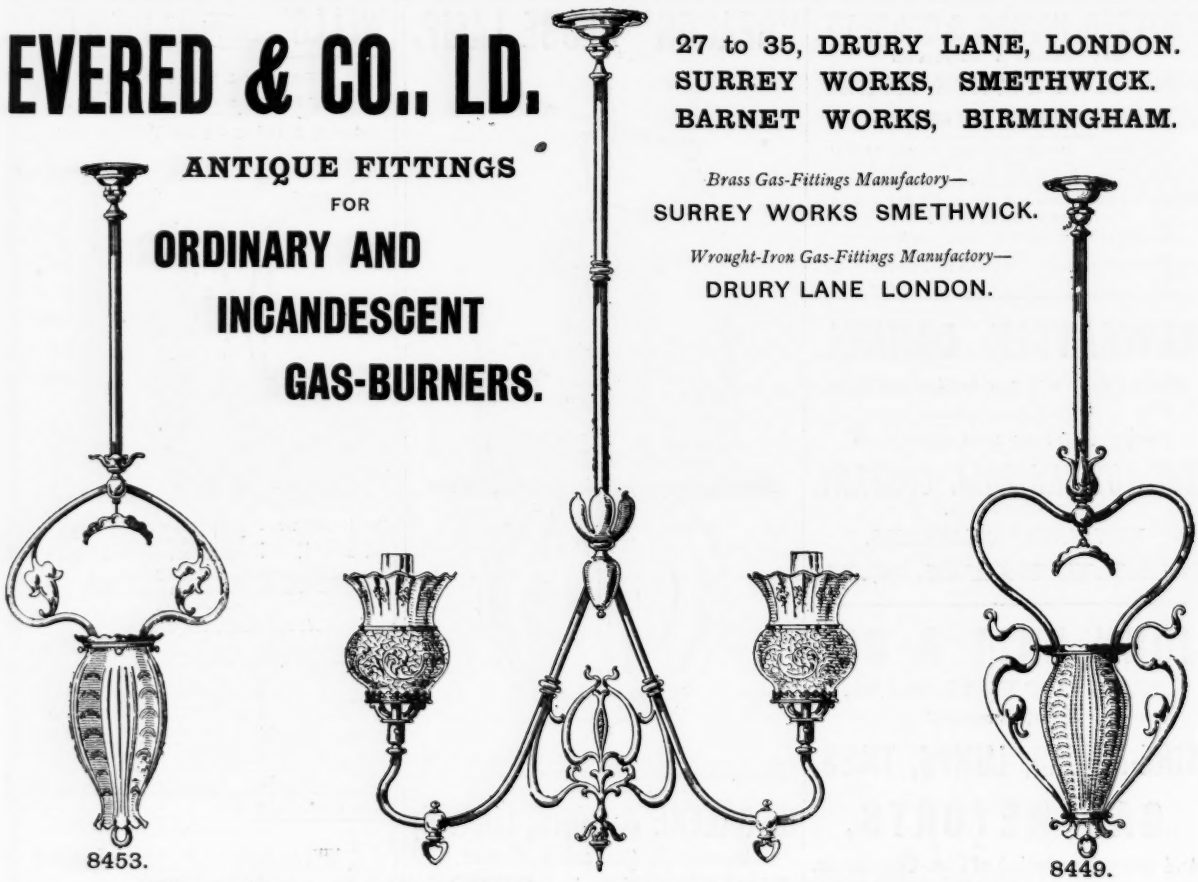

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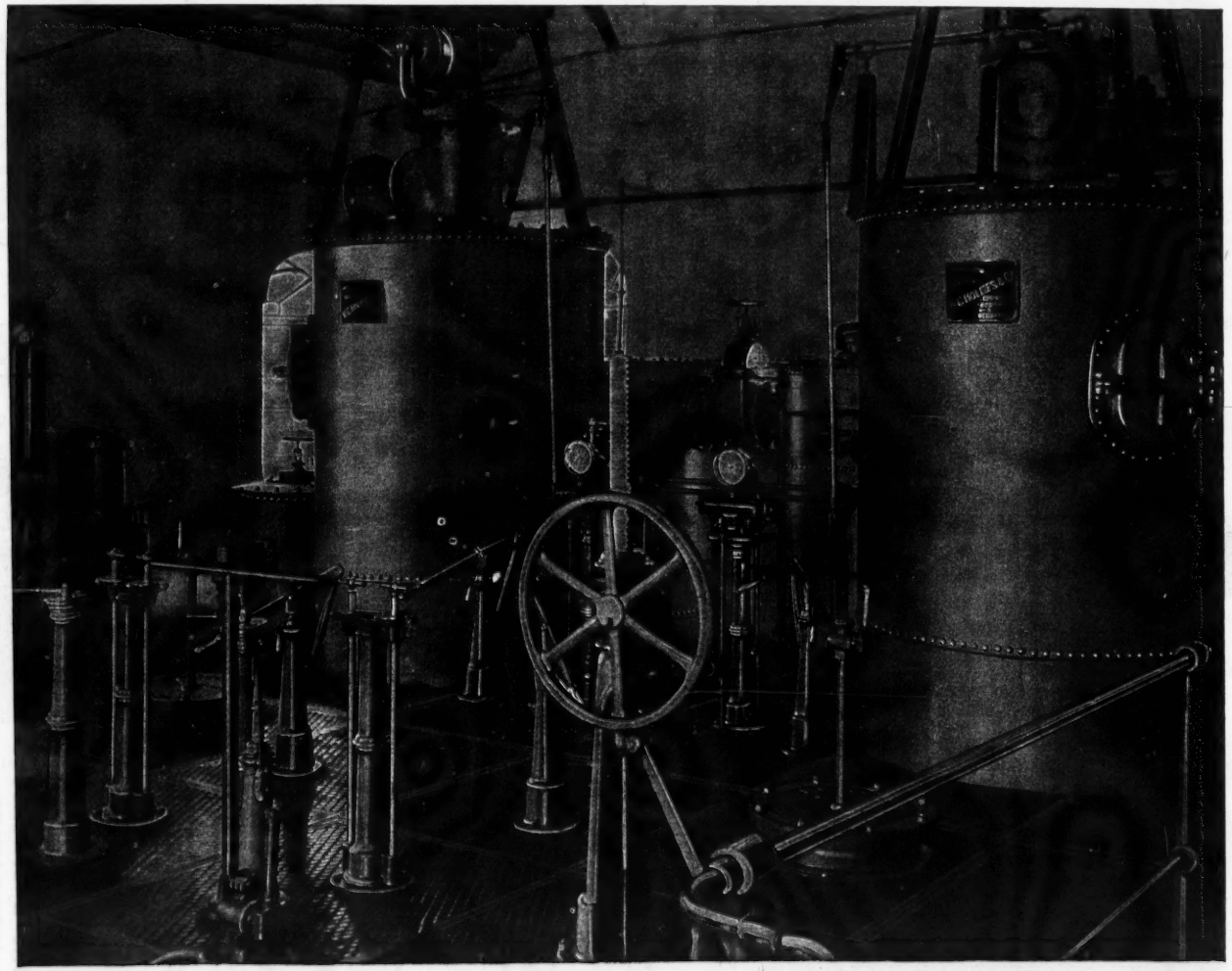

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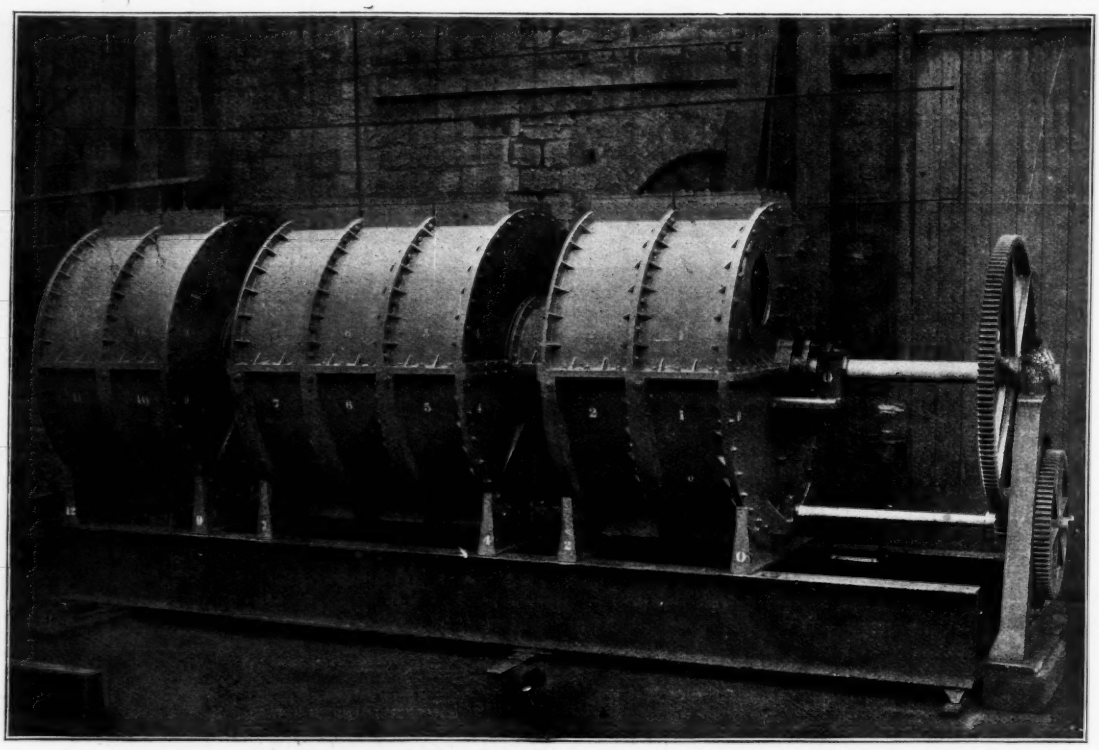

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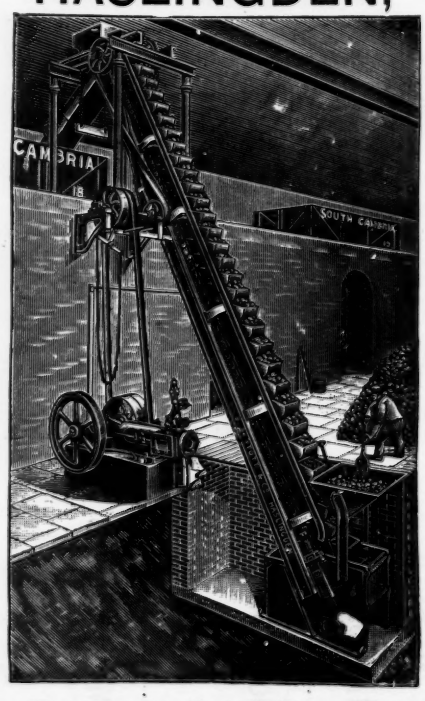

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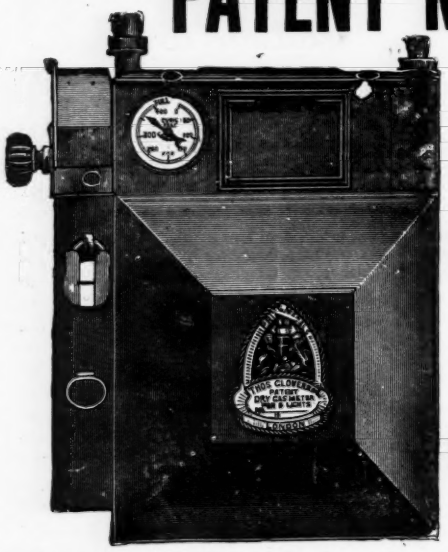

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EDITORIAL NOTES.

Thirteen-Candle Gas—No Sulphur Clauses!

FRIDAY last, the 8th of May, 1903, will henceforward be a notable date in the history of the gas industry of the United Kingdom, for on that day it was intimated by the Parliamentary Committee presided over by Sir John Brunner, that for the future gas manufacturers ought to be freer than ever before to profit by the advances of science and invention. With this object, the fetters of antiquated penalty testing were, as on this memorable day, struck off from the undertaking hitherto known as the Crystal Palace District Gas Company, who were thereupon first granted a reduction of the standard of illuminating power to 13 candles, tested by the most favourable method for the gas, and were relieved from the obligation to purify their gas from sulphur compounds. It was a step forward from the precedent of 1900, in the same spirit. The Company succeeded in convincing the Committee of Parliament that gas supply is a business to be carried on, like any other, upon commercial principles. The London County Council and other Local Authorities concerned justified the noble British municipal tradition, by placing every obstacle they could think of in the path of the deliverance of the gas undertaking from restrictions nearly half-a-century old, and altogether out of harmony with the times. They produced the same Rip van Winkle sort of evidence against the Company as they contrived to dig up in different quarters for use against the South Metropolitan Gas Company in 1900. The customary Chairman's formula, "The Committee think the preamble of the Bill "is proved," meant in this case the turning over of a new leaf in gas legislation. For the Bill so accepted provides for the lowering of the standard of illuminating power from 15 to 13 candles, as already stated, and repeals the sulphur purification clauses of the Company's older Acts; and it does so for no other special consideration than the reduction of the standard price by 1d.—from 2s. 10d. per 1000 cubic feet for 15-candle gas, with sulphur compounds purification, to 2s. 9d. for 13-candle gas, without the sulphur clauses—and it effects all this on the simple faith, endorsed by the emphatic dictum of the Committee, that the time has arrived when gas manufacturers should have more liberty to serve the public to the greatest known advantage.

The news of this great deliverance will ring through all England, wherever gas is manufactured for sale under statutory conditions; for it is indeed a piece of joyful tidings. A victory has been won over the powers of Obscurantism in gas matters, and the industry will hasten to take advantage of it. Gas has been set free, in this precedent, from the cramping burden of penalty testing for illuminating power, and from the exaggerated purification requirements which were never worth their cost and trouble, and have long lost any small importance they ever possessed. Whatever was to be said for the reduction of the sulphur impurity of gas, other than sulphuretted hydrogen, to an arbitrary limit of 22 grains in 100 cubic feet or thereabouts, at a period when the amount of light obtainable from the gas depended upon the burning of a large quantity, and it was not used for any other purpose, the value of the requirement has for years been a diminishing quantity; while the cost, trouble, and annoyance of the purifying process have grown with the growth of the industry. It was high time for the sulphur clauses to go; and they have departed. Nor did the opponents of the Company in the present instance make much of a fight to retain them. On the contrary, the tameness with which the once fiercely-canvassed sulphur clauses were left to their fate was not the least remarkable feature of a remarkable situation. In coming down to a 13-candle standard, the Company practically dispense with penalty photometry, which will no longer be a bugbear. In all probability the gas sent out will not often be much below 14 candles; but the most satisfactory thing about this new settlement is that the quality of the gas will not really matter, for a 13-candle standard is quite safe for working to in the ordinary way.

The Bill contains other provisions—adoption of workmen directors, and so forth—which are valuable and noteworthy in their degree, but are not of the things for which the Act will be cited as a precedent. It is not the result of an accident, or of a happy treatment on the part of the promoters. It is memorable as being the enactment of principles of reform in gas legislation which were certainly in the Bill as drafted, but as certainly met with a predisposition in the same direction on the part of Parliament. Very early in the proceedings, the Chairman declared that Parliament would no longer favour the fossilization of testing methods in accordance with ideas and instruments useful once, but now out of date; and at the end he made the declaration in favour of the freedom of industry which this Act will be the first to realize. The occasion was a personal triumph for Sir George Livesey, who at the last was called upon by the Chairman to act as *amicus curiæ*, with the object of satisfying the minds of the members of the Committee in respect to the fairness of his own proposals! This great victory will bear fruit in greater abundance every year. For, of course, a new chapter in gas legislation now opens. The iron must be struck while it is hot; and Sir George Livesey, at any rate, is not likely to let it grow cold.

The General Parliamentary Business of the Week.

IN the general work of the Private Bill Committees of Parliament last week, which was a very busy one for both Houses, there were included the consideration of the Birmingham Corporation Bill, which was accepted by a Lords Committee, and the commencement of the inquiry into the provisions of the North-Western Electricity and Power Gas Bill. The Birmingham Corporation Bill comprised a part relating to gas; the object being to sanction the Erdington gas-works scheme. This would have been done in the past year, but for the unfortunate accident which resulted in the wrecking of the Birmingham Corporation's whole legislative venture because of a tramways dispute. It is unnecessary to go into the details of the scheme, which is based upon the necessity for providing for the future gas demands of Birmingham. The opposition was of the usual character, and failed to gain the sympathy of hereditary lawmakers, notwithstanding the tenderness for the landed interest usually attributed to members of the Upper House. The truth was that there is nothing to urge either against the wisdom of the Corporation policy in taking time by the forelock, or in condemnation of the chosen site. Unless Birmingham suddenly stops growing, or gas as suddenly goes out of use, another gas-works must be had; and it appears by all accounts that the Corporation are to be complimented upon their foresight and skill in making the purchase of the Erdington Estate.

The North-Western Electricity and Power Gas Bill is a measure for obtaining the sanction of Parliament for what it is difficult to regard as other than a "wild-cat" scheme. All the same, it is probable that the promoters will get their Act, for the general reason that Parliament is averse to blocking the way to enterprise because many people do not believe in it. There is a good deal of invertebrate opposition to the Bill on the part of the statutory gas interests affected; but many of the territorial opponents are being settled with. Much of the opposition already disclosed in the Committee-room is really upon clauses; and as such it tends to assist in proving the preamble. Being firmly persuaded that every purely power-supplying scheme at present on the stocks—with at most two or three possible exceptions—is foredoomed to financial failure, we cannot approve of the multiplication of such projects, even where they do not specifically injure the statutory gas interest. The rush for parliamentary facilities to set up power plants before a single one has paid for itself, is to be accounted for by the keenness of competition in trade. It would be impossible to conceal the success of a power plant, supposing this to happen; and it would then be too late to begin to stake out

other claims. The latter highly speculative work must be done, if at all, in advance, and on general principles. It is gambling, all the same. A good deal of money would be saved if Parliament would hang up all schemes of the kind for (say) three years.

Seven-Day Gas Testing for London.

THE action brought by the London County Council against the South Metropolitan Gas Company, to ascertain the law as to Sunday gas testing in the Metropolis, was tried before Mr. Justice Joyce on Monday of last week, and the result briefly recorded in the "JOURNAL" next day. A full report of the proceedings will be found in another column. Though a very considerable amount of discussion has been aroused by the recent decision of the Council, as the gas-testing authority for the Metropolis, to test the gas supplied by the three Metropolitan Companies on Sundays and holidays, as well as on what are sometimes distinguished as "lawful days," the legal question as to whether they have power to do so lies within an extremely small compass. It is not, however, without complications, which arise, as usual, in respect of the definition of terms used in the Special Acts. The question here was: What is a "day" within the meaning of the statutes? It appears that the South Metropolitan "day" for gas-testing purposes means the 24 hours from 9 a.m. on one day to 9 a.m. on the morrow. It follows from this definition that if Sunday were a *dies non*, it would be Saturday from 9 a.m. on that day to 9 a.m. on Monday. According to this rule of interpretation, a Saturday test would cover all the time until Monday; and the same would apply to any lapse of time similarly deleted from the calendar.

The statute says that the gas shall be tested daily at every testing-place; and that the daily reports of such tests are to be the evidence upon which any subsequent proceedings are to be taken. This is all plain enough so far; but it is also enacted that the purity of the gas on any day shall be deemed to be represented by the average result of the tests made on that day and the preceding and the following days. The further question that arises here is, how the omission of Sunday testing affects the taking of this three-day average. The ordinary man would in all probability be inclined to think that it would not affect the rule at all, inasmuch as Saturday remains one day irrespective of its length; so that, for the purposes of any Act which deletes Sunday from the calendar, Saturday might be the beginning, middle, or end of any three-day sequence. At any rate, the South Metropolitan Company concluded that they would not be a party to the breaking of the Sabbath for any such purpose, more particularly as they endeavour to suspend all their manufacturing operations on this day. In opening the case against the Company, Counsel mentioned, but very quickly passed over, the consideration of whether in law a gas company are compellable to supply gas at all on Sundays. All he could say on this head was that "it seemed fairly clear "that the obligation to supply gas extended to Sundays as "well as weekdays." But this is hardly sufficient. It is, indeed, stated on the authority of Mr. Justice Byles that "Sunday at common law was just like any other day." It would not be safe for a mere layman to trust too much to any such dictum. A man is doubtless amenable to the criminal law for anything he may do on Sunday; but he cannot on that day commit an offence under the law of bankruptcy. Counsel argued that, unless expressly excluded, Sunday is included in Acts of Parliament as a day. It is a curious inquiry, arising out of these considerations, whether an action would lie against any gas company for refusing to supply gas to a consumer—for instance, a church—on Sunday.

It was an important point in the objection taken by the defendant Company that not for forty years had the presumed necessity for testing on Sundays been thought of by the public authority; so that they had organized their operations of every kind on the assumption that Sunday was a day of rest. Much matter of curious historical interest is contained in the address of Mr. Warmington, K.C., for the defence, in which it was argued, among other pleas, that daily testing of gas on weekdays only was the practice in the Metropolis antecedent to the passing of the Act making it statutory. Hence the practice should be used in interpreting the law applying to it. Lord Robert Cecil contributed to the controversy a distinction between working days and running days, contending that sometimes the word "daily" refers to one and sometimes to the other. The Judge accepted the challenge of Lord Robert Cecil, that the whole question before him turned on the meaning of the word "daily" in the particular connection. He therefore decided that this word, occurring in section 7 of the Act of 1880, means every day, inclusive of Sunday. Judgment accordingly went against the Company, with costs. Of course, there will be an appeal; and it seems rather a pity that, in such a case, where one of the parties is quite determined to carry the matter to the House of Lords rather than give in, this procedure could not be entered upon forthwith. Without presuming to question the law of Mr. Justice Joyce, it must be conceded that there are a good many applications of the word "daily" which do not mean every day. Lord Robert Cecil mentioned one—the "daily" newspaper, which nobody understands to mean a paper published seven days in the week. The present staff of gas examiners employed by the London County Council are presumably engaged to test gas daily. Does this mean that these gentlemen will have to work seven days in the week? If not, why not? Mention was made in the course of the hearing of a special staff of examiners as being employed in this Sunday testing. It should not be necessary, if Sunday testing is part of the daily work of the regular examiners.

Imperial Continental Gas Affairs.

LAST Tuesday, as deputy to Mr. T. H. Goodwin Newton, Mr. T. Horsley Palmer performed the duties of the chair at the half-yearly meeting of the Imperial Continental Gas Association; and the following day, by the vote of his colleagues, the latter gentleman was raised to the dignified position of head of this remarkable concern—for "remark-"able" it is. We know of no gas concern in the direction of which, in the same degree, such a variety of ability is required as in this one. Diplomatic acumen, knowledge of several Continental currencies and commercial values, business aptitude of a high order, and practical experience in the special work of gas engineering, manufacture, and supply—all these and more are the requisites which, to maintain success, must be combined in a Board administering the affairs of a concern with operations centred in so many places, and among so many different peoples, to whose grace the length, and the extension of the length, of life of the several undertakings are subject. All this variety of ability the Association possess in the constitution of their Board; and it is to that, and (as attested by Mr. Corbet Woodall) to the devotion, sagacity, and tact of an eminently fine set of officials, that the undertaking enjoys the position and prosperity of to-day. Ill-health now (we, among many others, regret) deprives the Association of the services of Mr. Newton, during whose premiership, it must not be forgotten, the concern has passed triumphantly through exceptionally critical times—to-day finding it, owing to its great virility and recuperative force, with its strength not only unimpaired but improved. There has been the loss of the principal Vienna station, the period of high-priced coal and other material, and the last few years have been particularly active ones in the matter of concession negotiation. But peace, prosperity, and soundness of foundation and superstructure, are the present main attributes of the concern; and everything points to their long continuance.

Such is the happy condition in which Mr. Newton quits the leadership of the Association, and Mr. Horsley Palmer takes up the work of the office. To both, the position of affairs must be, and is, a matter for extreme gratification. The Company have a large reserve, dividend equalization, and amortization funds; the output of gas was extended last half year by above 7 per cent.; the number of consumers increased (in the past twelve months) by 21·601, or 9·1 per cent.; the price of coal is easier, though residuals have fallen in value; the profit for the half year to Dec. 31 was £25,000 more than in the corresponding period of 1901; and the average length of the concessions has been further increased by prolongations and new successes. In fact, the business is flourishing in such manner and extent that the Directors foresee that the development that is going on will soon offer them the openings for the profitable investment of further new capital. All this is highly satisfactory and pregnant with promise.

One or two sentences more. In view of the suggestion made in these columns six months since, that it would be a

matter of supreme interest if the Directors would publish some specific information as to the progress of their electrical ventures, we are much interested in the remarks of Mr. Horsley Palmer on the subject at last Tuesday's meeting. Of course, it is well understood that, in the case of the Association it is policy rather than profit that has largely dictated the rule of action in this regard. While no specific information was given, this one statement made by Mr. Palmer is full of point: "I do not pretend that the return "on our money on electric-light undertakings—whether at "Vienna, Berlin, or wherever it may be—comes up to the "return we receive from gas. It does not." To obtain a declaration such as this from the experience of the Association is something worth having.

Pending Coal Contracts—Exports Decreasing.

In spite of many rumours to the contrary, we believe it to be still the fact that, so far as the great bulk of London's requirements are concerned, the coal contracts for the ensuing year are not finally arranged—indeed, the biggest buyer of all, the Gaslight Company, is only just opening negotiations. It is therefore important to point out to prospective buyers that the conditions which have prevailed in the coal market during the past six months, and caused that market to display a firmness in the early part of this year which was not calculated to encourage hopes of a very material reduction in prices, have recently undergone a change for the better from the buyers' point of view. The unfavourable conditions were: (1) The fear of a stoppage of work in the South Wales coalfields; (2) the possibility of trouble in the English federated coalfields; and (3) the abnormal exports of coal to the United States.

So far as South Wales is concerned, a peaceful settlement was assured some weeks ago; and although one or two points still remain to be adjusted, it has been agreed by both parties to leave their determination to an arbitrator. In regard to wages in the federation area, the fear was lest trouble should arise if Lord James of Hereford gave his award in favour of the reduction claimed by the owners; the miners having at the same time claimed a substantial advance. The long-expected and long-delayed award was given last week, and leaves matters *in statu quo*. The miners, therefore, will continue to receive wages on the basis of 50 per cent. above standard—a very handsome rate of pay, considering the present condition and future prospects of the trade—and matters will doubtless remain quiescent in the Midland coalfields for some time to come.

As to the exports of coal to the United States, the figures for the month of April are the most encouraging to coal consumers in this country that have been seen since last summer. During the last quarter of 1902 the increase in coal exports to the States amounted to 715,000 tons. In January, the increase was no less than 566,000 tons; in February, 295,000 tons; in March, 115,000 tons—a total of 1,6[illegible],000 tons in six months. For April, the increase was only 34,000 tons. In other words, the abnormal flow of coal across the Atlantic has practically ceased; and the potential output available for sale in this country is increased to the extent of nearly 3½ millions per annum compared with the position at the beginning of this year. We commend this fact to the careful consideration of any buyers whom colliery agents are trying to persuade into believing that the coal trade has touched bottom and is now on the upward grade. If they need further argument, we would point out that, while the total shipments of coal from this country showed an increase of 1,490,000 tons for the March quarter, there was an actual decrease of 127,000 tons in April, and merely add that it is a matter of common knowledge that the potential output of the collieries in working order in Great Britain was never so great as it is at the present moment. The iron and steel trades are fairly active just now, owing to the requirements of America being temporarily greater than her available supplies; and the coal-owners are running this fact for a great deal more than it is worth. We hope that coal buyers will not allow themselves to be bluffed in this way into accepting a smaller reduction in price than the real state and prospects of the market warrant.

Peaceable Striking.

The House of Commons on Friday night was occupied in discussing what is somewhat humorously entitled "A Bill to "Legalize the Peaceful Conduct of Trade Disputes." It must strike most readers of this title that a project of legislation truly answering to it must be supererogatory. There is no law, human or divine, against disputes; and those who differ from one another on any matter under the sun can indulge themselves in this way to their heart's content, so long as they do not cause injury or annoyance to anybody else, or disturb the King's peace. But, of course, the true meaning of this Bill's title lies in the application thereof. It is intended to legalize what is called "peaceful picketing" before or during strikes, and also to amend the law of conspiracy by making it legal for any number of persons to do together what one might do individually. Five hundred peaceful persons would, under the terms of this Bill, be allowed to "attend" at or near any person's dwelling-house or place of business for the purpose of "peacefully" obtaining or communicating information, or of "peacefully" persuading any person to work or abstain from working. It is a deplorable fact that no fewer than 226 members of the House of Commons voted (in a way) in favour of this proposal, against 246 who supported an amendment moved by Mr. Galloway, which favoured a general inquiry into the existing laws affecting trade disputes.

The Government adopted this view, chiefly on the respectable ground that the last investigation into the subject was held thirty years ago. If the Government really mean business in offering an inquiry, separated from politics, into the state of the law of trade combinations, they deserve the support of both employers and employed—not omitting the general public of consumers—in this regard. Things done by any person in restraint of trade should be stopped, and the liberty of the subject safeguarded from the injurious machinations of those who would encroach upon it for their own selfish ends. Now, if Trade Unionism is not selfish, it is nothing. No professional Labour politician, either in or out of Parliament, can be quoted as advocating the system with which he is identified, for reasons of general utility. When Trade Unionists think a little less of themselves, and considerably more of the share of responsibility which they, with all other citizens, bear for the advancement of the common good, they will have a better hearing. At present, the favourite contentions put forward by the Labour politicians, that the Trade Union workman ought to be regarded as superior to laws that bind other people, and escape the taxation which goes with citizenship, do not command universal respect.

A noteworthy but, to employers of labour, not at all a surprising aspect of Trade Union organization is attracting public attention. This is a revolt of the Scottish and North of England members of the Amalgamated Society of Engineers against the Executive of this Union, who have ordered them to accept a reduction of wages to which they are strongly averse. Of course, the more democratic among the daily newspapers profess to be unable to understand the action of these misguided rebels against a governing and directing authority of their own choosing. The Executive of the Society ordered the men to go on working; and, in reply, the men went out on strike. In vain, the great Mr. Barnes went to Glasgow to see to matters personally. It is reported that the Clydeside fitters do not like Mr. Barnes; at all events, upwards of 3000 of them met on Friday and determined to set his orders at defiance. Such behaviour evidently disparages, in the eye of the world of politicians, the official view that Trade Unions are admirable institutions, inasmuch as they offer employers firm support for collective bargaining with their members. So they do, so long as the advantage is on the side of the men. The time to test the worth of a Trade Union, however, is when the Executive advise acceptance of reduced wages, or attempt to stop a popular strike. The organization rarely bears the strain. At such periods of emergency, every professional Trade Union leader stands confessed a Tappertit. He does not like the exposure, of course, especially as it gives his show away to the other members of the Tappertit family who pose in cheap newspapers as moulders of public opinion. It cannot be helped, and perhaps it is all for the best. Employers who, through Trade Union influences, have lost the allegiance of their workpeople, would be more than human if they did not smile at cases of the disaffection of members of Trade Societies towards the officials of their own election, such as the one to which we have been referring. It is old-world knowledge, that mutineers can never hang together for very long, even when the alternative is to hang separately.

Gas Companies and Canal Haulage.

It is hard to imagine what would be thought in England of a new departure credited to the Cincinnati Gas and Electric Company. The very name of the Company indicates a freedom of enterprise which seems to be unattainable in a settled land, where every branch of human activity is expected to proceed upon well-defined lines, every one enjoying its own right of way and forbidden to cross over into another. The Cincinnati Gas Company are the surviving representative of numerous undertakings which have swallowed one another. The last concern to disappear from independent existence by this process was the local electric lighting and street tramway. The Gas Company had the wider jaws, and managed to get outside. Now it appears to do everything for Cincinnati in the way of light, heat, and power. But the latest result of this remarkable consolidation of interests is really exceptional. Other American gas companies provide electricity and work street railways in the intervals of selling gas; but the Cincinnati combination has undertaken to resuscitate haulage on the Erie and Miami Canal, 244 miles long—thus restoring a means of transporting heavy goods which railway carriage had for a long time obscured. At the present time, the importance of inland water carriage for minerals and other suitable traffic is again asserting itself. The question of haulage is the governing one in this connection; and the Cincinnati Gas and Electric Company are going to solve it by an electric method. A line of rails is to be laid along the towing-path, on which will travel locomotives taking current from flanking trolley-wires in the ordinary manner. These engines will tow lines of barges at a maximum speed of four miles an hour. Enough of the work has already been done to prove the practicability of the plan; and the rest is mere detail. The really striking feature of the whole arrangement is that an old canal, older than railways, connecting the Ohio River at Cincinnati with Lake Erie at Toledo, and fully capable in proper hands of carrying an enormous quantity of merchandise, has been restored to active service by the Cincinnati Gas Company, who have works on the canal bank. The transport service will be managed by a subsidiary company formed for the purpose, who expect to pay well, as the operating expenses will be extremely small. Electric haulage of canal-boats is practised in France and in Belguim, on very similar lines, but on a smaller scale.

The Welsbach Position.

The meeting of the Welsbach Company which took place in time on Monday last week for an epitome of the proceedings to be published in the following day's issue of the "Journal" was composed of several conspicuous features; but foremost among them were the unanimity of the proprietors in their endorsement of the Directors' administrative policy, and the almost entire agreement with which the large scheme of capital reorganization was approved. This is the most eloquent attestation of approbation and confidence that the Directors could possibly have had in the critical circumstances of the present time. Looking back over the past, it may be emphatically declared that, with the full acceptance of the Directors' reorganization scheme, the Company to-day is in a happier and more hopeful position than it has been in at any time during the last five or six years; and for this the proprietors are indebted beyond recompense to the Advisory Committee appointed in 1901, and to the Directors who took office in the early part of the year following. The task of composing and bringing down to a workable level the affairs of the Company has been a large and anxious one. The result is disclosed in the statements published a fortnight since in the "Journal," and in the plain and dignified utterances of the Chairman (Mr. Edgar Williamson) at the meeting as reported last week. It would not have been a matter for surprise if, during the process of restoration to a possible commercial status, the profits of the undertaking had further diminished. But the contrary is the case. Not only has the policy of the Board produced larger profits, but the prospects noticeably incline to increasing prosperity—depending now entirely on the capital being brought down to a dividend-earning level. Though well-conceived, and, under the circumstances, as equitable and fair as any scheme could be, it was too much to expect it would be accepted without some show of opposition. But at a large meeting representative of the proprietors of all classes, it was not anticipated that opposition would only be found in about a dozen quarters, and then on the side-issue as to whether funds which the Board have accumulated should not, rightfully, pass into the pockets of preference stockholders. On this point the Directors hold the best legal advice to the contrary. To raise such a matter at the present stage is nothing short of ridiculous. What would it profit the preference stockholders if they gained the whole of the accumulated savings, and, in so doing, shattered the prospects of the concern, depreciated its market value, prevented the consummation of the present scheme, and in all likelihood divorced the interest of a Board of Directors and Advisory Committee who have so far successfully restored the tottering Welsbach edifice? It will be more than a pity if the few malcontents succeed in their manifest schismatical intentions to an extent sufficient to overthrow the projected reorganization. The necessary separate meetings of the proprietors to discuss the scheme have been called for the 20th inst.; and then all well-wishers of the Company will hope to see good sense and justice ruling the vote, and the irreconcilables put to shame by their insignificance in numbers. One part of the proceedings at last week's meeting, which we were, owing to pressure of time and space, unable to include in the report, is published elsewhere this week; and it will be found to disclose some further sensational financial transactions on the part of the former directorate.

Relieving the Rates at Manchester.

A fortnight ago, when referring to the profits made by the Manchester Corporation Gas Department during the year ending March 31, it was remarked that, as usual, the sum of £50,000 was to be taken in relief of the rates. To most people, ourselves included, this would seem to be a more than ample return to the citizens for the risk attaching to their investment; but this is evidently not the way in which the Manchester Corporation view the matter, for after the manner of Oliver Twist, they have been asking for more. Unlike that luckless individual, however, they have not asked in vain; it having been decided that the contribution of the department out of the profits to the relief of the city rates during the current year shall be £70,000, instead of the £50,000 recently decided upon. Last year, for the first time in the history of Manchester, the estimated expenditure exceeded a million pounds; and this year it is calculated that some £40,000 more will be required—owing to the increased expenditure on education under the new Act. Fortunately, the Tramways Committee expect to be able to hand over £50,000, as against the £30,000 contributed last year; but this still leaves about £20,000 to be provided from some source, if the rates are not to be raised. What more natural than that the Tramways and Gas Committees should find this extra amount between them? It is so simple—it is only necessary to charge the customers enough, and there you are. People must use tramways, and they must burn gas; or if they refuse the gas at the price charged, and fit up the electric light in its stead, why, then (as the owner of the electricity works) you have their custom again. The Chairman of the Manchester Tramways Committee has declined to take part in the proposed arrangement; and so the Gas Committee have magnanimously agreed to take the whole of the extra burden on their shoulders. In doing so, however, they "desire it to be understood that their action is to be regarded, not as a precedent for future years, but as a special proceeding under exceptional circumstances." We should hope so indeed. Since the works were acquired by the Corporation, a sum of over two-and-a-half millions has been paid over out of the profits in relief of the rates; but this figure, large as it is, would soon be left a long way behind if the Committee were to continue in their present generous mood. Generous, that is, to the ratepayers at large—not to the gas consumers, who have a prior claim on their consideration. It is true that a reduction in price of 3d. per 1000 cubic feet has been announced to take place as from June next; but, in view of all the facts, the consumers might fairly urge that they were entitled to a more substantial concession than this.

And at Wigan.

The justice of making the gas consumers pay some portion of the rates of those who do not burn gas, has in the past been

strongly challenged in many places, including Manchester; and last week there was (as is duly recorded in another column to-day) a long discussion on the subject at the meeting of the Wigan County Borough Council. There, also, the question is not a new one, for it has been raised very many times before. The amount transferred on the present occasion by the Wigan Gas Committee in aid of the rates is £11,800; and without this assistance the rate would have been 1s. 3d. in the pound higher. What a handsome present this is to the big works which, as one member put it, contribute not a single penny to the Gas Department in any other way than as rateable value for loan purposes. The arguments adduced by this gentleman in support of his contention that, as the gas was mainly sold to the poor, they should receive the first consideration, either by the whole of the profits being given up to the users of gas or the cost of the gas being such as to allow merely a reasonable reserve for the payment of interest and sinking fund, are worthy of serious attention; and we note with satisfaction the promise of the Chairman of the Gas Committee that the matter shall have early consideration. The Vice-Chairman of the Finance Committee, in the course of the discussion, innocently inquired what would happen if there were a deficit instead of a profit on the gas-works. The answer, of course, is a very easy one, and supplies one of the strongest arguments possible in favour of the view that any profits made should belong in the first place to the consumers. If the estimates showed that a deficit was probable on the working of the undertaking, the price of gas would be promptly raised. Why, therefore, when there is the prospect of a profit, should not the charge be as promptly reduced? The price of gas is not regulated by any of the considerations which apply to commodities in the supply of which there is competition—as is the case with such things as bread, meat, and coal—but can from time to time be varied by local authorities so as to ensure that both ends shall meet. It is this very elasticity which reduces practically to *nil* the risk run by the ratepayers generally in becoming the owners of the undertaking, and therefore makes them unentitled to any particular consideration. Gas-works are said to be purchased by municipalities for the good of the community. Of course—but then let the community derive its benefit by becoming consumers of gas supplied at the cheapest possible price. Everyone needs light and heat, and in this way would enjoy whatever advantage there might be from the transaction in proportion to the support accorded by him to the undertaking. This would increase the direct taxation; but people would see more clearly what their local government was really costing them—which would be another advantage.

Electricity Six Times as Dear as Gas.

When the question of gas *versus* electricity for street lighting purposes is under discussion, Liverpool is frequently cited as a case where, though there is a Municipal electric light undertaking and the gas supply is controlled by a Company, gas still remains the favourite illuminant for the public lamps. If any persons should wonder at this being the case, they will probably cease to do so when their attention is called to a statement made at the last meeting of the City Council, when, a proposal having been made that the upper portion of London Road should be lighted by electricity, Alderman Petrie made the startling statement that to introduce the electric light all over the city would mean a lighting rate of 2s. in the pound, as against 4d. in the pound at present. He contended that if they agreed to this suggestion, applications which could not be refused would be received from similar neighbourhoods; and besides this, it was stated that the City Lighting Engineer could not see his way to support the proposal, on the ground that he was of opinion that lighting by gas as at present was "more efficient and less costly." Needless to say, the statement of Alderman Petrie did not meet with the unanimous approval of the members; but, at any rate, his assertion was not disproved. It is true one councillor remarked that if Alderman Petrie really thought they believed what he had said, he must think them "a lot of jackasses." This may have formed a very interesting item in the discussion; but it hardly strikes one as constituting a technical argument of any great value. If the advocates of electricity are going to drive the incandescent gas-lights from the streets of Liverpool, they will need to use stronger weapons than this; and should they ever succeed in their desire, Alderman Petrie will be in the enviable position of being able to say, "I told you so," for they will assuredly find their victory more disastrous than a defeat. That time, however, is not yet.

Liability for Explosions in Electric Light Boxes.

The failure of the Charing Cross and Strand Electricity Supply Corporation, Limited, in their two appeals heard last Wednesday against a judgment for £150 in favour of W. S. Kidd, one of their jointers, again brings before the public the dangers arising from the supply of electricity. It also throws some light upon the treatment meted out to a workman who risks his life, on the orders of a foreman, to save the public from danger and his employers from liability. To say the least of it, the Corporation, with their huge capital and ambitious schemes, might have allowed the workman his half pay under the Workmen's Compensation Act. Instead of this Kidd was soon shunted from his allowance, and he has had to wait for nine months for a judgment which may even again be appealed. It is to be hoped, for their credit, that they were forced unwillingly into litigation by an ungenerous Insurance Company. One thing is now clear—that the slipshod methods of the electric light undertakers must be revised, even supposing this may cost some companies £40,000. The public, with their other dangers and inconveniences, can ill afford to run the additional risk of being blown into the air at any moment. What is generally known as the B. I. W. cover is not sufficient to admit of the escape of the heavy bituminous gases which arise from the cable wrapping upon partial combustion. The wires, too, are insufficiently protected from the filtration of the rain and the corrosion arising therefrom. It is probable that the original cause of the fire at the Haymarket box was corrosion and consequent sparking. Then neither the spare way nor the cable conduits were properly plugged. Plaster of paris should have been used to prevent the permeation of the gas to the whole system. An upcast shaft or an underground tube should be used for the collection and exhaustion of the gases arising from the insulating wrappings. A less dangerous wrapping should be found, even if it is to cost more. Stopcocks should be inserted as frequently as are the taps and valves on water-mains. These plug-cocks could be made of a non-conductor, with a copper wire penetrating in one direction horizontally. They could be turned off or on from a central electric fire station fitted with automatic fire alarms. Some electric companies plead that they have no power to erect upcast shafts; but the fact is that they did not ask Parliament for compulsory power, because of the expense.

The "James Forrest" Lecture.—The third engineering conference of the Institution of Civil Engineers, which, as stated last week, will take place next month, under the presidency of Mr. J. C. Hawkshaw, will be inaugurated by the delivery, by Mr. W. H. Maw, M.Inst.C.E., of the "James Forrest" lecture; the subject of which will be "Some Unsolved Problems in Engineering."

West's Compressed-Air Stoking Machinery in Germany.—A short time ago, on the recommendation of the Engineer (Herr Salzenburg), an order was given for West's compressed-air stoking machinery for the Crefeld Gas-Works, Germany. It has recently been put into operation, and has now been successfully working for a few weeks—the men having very soon become proficient in manipulating it. It is interesting to note that this is the first installation of West's stoking machinery in Germany.

Death of Mr. Rokeby Price.—The death occurred last Friday, at St. Albans, in his 82nd year, of Mr. Hall Rokeby Price, head of the firm of Messrs. Price and Pott, who was for upwards of thirty years a member of the Committee of the Stock Exchange, and for seven years its Chairman. The deceased gentleman was at one time frequently seen at meetings of the London Gas Companies, in which he was largely interested; but for the past two or three years he had not been in the City. He was a Director of the Colne Valley Water Company and of the Leatherhead and District Water Company.

The Late Mr. E. W. T. Richmond.—After hearing evidence for two days at Penzance and Counsel's addresses in London, Mr. Duke, K.C., M.P., the Recorder of Devonport, gave his award last Saturday in an arbitration case in which the Executors of the late Mr. E. W. T. Richmond claimed from the Commercial Union Assurance Company, Limited, £2000 alleged to have become due on Mr. Richmond's death through the cycling accident in Cornwall last summer. The Company disputed the claim upon the ground that the rider was guilty of such gross carelessness and exposed himself to such danger as to invalidate the policy. Mr. Duke awarded the full amount claimed, with costs.

ESSAYS AND REVIEWS.

MR. CARNEGIE ON THE PAYMENT OF LABOUR BY RESULTS.

THE proceedings at the annual meetings of the Iron and Steel Institute frequently are of interest to a far larger section of the public than that primarily concerned in metallurgical and engineering industries—a natural consequence of the fact that our national prosperity has been and is in no small measure dependent upon that of the iron, steel, and allied trades. The proceedings at last week's meetings were, however, of more than ordinary interest to the general body of commercial men, by reason of the presidential address being devoted to a subject common to all industries and not special to the iron and steel business, and by reason ot that address being delivered by one of the most prominent and successful men of business in the world. The President was Mr. Andrew Carnegie; his subject, "the organization and management of that most complicated piece of machinery—man." It does not need a very long experience of business life to learn that the most successful of all managers is he who can successfully manage men—by which we mean, of course, not merely keeping subordinates in a condition of reasonable discipline, but choosing the right men for the different branches of a business, and obtaining from all the men employed the maximum amount of willing and efficient service. As to the selection of the right men for posts of importance in any business, little assistance or advice can be given, even by the most skilful judge of men, to those who have to do the work of selection; and Mr. Carnegie's only message to such is—Don't be afraid to choose a man for promotion because he is young. If he has the other necessary qualifications, then youth is in his favour, not against him. And, having chosen the right man, pay him what he is worth.

On the subject of getting the most and the best work out of the whole body of employees, however, Mr. Carnegie has much to say; and the few whose voices have for years been crying in the wilderness, that the solution of this and other labour problems is to be found in the direction of giving the workman an interest in his work beyond his actual wages, will rejoice exceedingly to find their views being endorsed on such an occasion and by such a personality as will ensure their receiving careful consideration by the industrial community generally. Their satisfaction will not be lessened on reading the speech of the Duke of Devonshire at the annual dinner of the Institute on Friday last, in which, after calling special attention to Mr. Carnegie's utterances on the subject of the relations between employers and employed, the speaker referred to the beneficent work which has been done in this direction by Sir George Livesey. Profit-sharing has made slow, very slow, progress in this country so far—due partly to the inborn conservativeness of the British employer, and partly to the failure of those who have tried it, to realize that it is not enough merely to institute such a system; for it requires careful administration. But considerable impetus should be given to its growth by the advocacy of Mr. Carnegie, whose vast experience gives to his opinion unusual authority and weight.

At the Carnegie works, the first move towards "profit-sharing"—to use the handiest expression—was by way of giving the head of every department a share in the business, such share being paid for by the surplus profits earned by it after deducting interest on its amount. A hypothetical case will make this more clear. The manager of a department is "lent" £10,000 worth of stock, for which he has to pay 4 per cent. interest. The year's profits in his department work out at 29 per cent. on the capital invested in the department. He is credited with £2900 and debited with £400; so that, if such rate of profit is maintained, at the end of four years he is the proprietor of £10,000 of stock, and has a few hundreds of profit to draw besides. In addition to making every manager thus a partner so far as money interest was concerned, the Carnegie policy included the representation of every department of the works upon the Board of Management and Committees; and no one will deny, at any rate in theory, the value of having among the directors of a business some, at least, who are acquainted with its working.

Mr. Carnegie passed from the question of managers to that of the payment of the rank and file, advocating on this point the regulation of wages by sliding-scale as affording in some degree a settlement by results. Whether the sliding-scale system is adaptable with advantage to every industry is an unsettled question, but that—properly administered—it is productive of highly satisfactory results in the gas industry has been proved to demonstration by Sir George Livesey; the principal difference between his sliding-scale and those generally adopted is that wages under it vary inversely instead of directly as the selling-price of the product. The Carnegie Company, or rather their successors the United States Steel Corporation, have found, however, as Sir George Livesey found, that profit-sharing by itself, though a movement in the right direction, is not sufficient to achieve the best possible results. And they have recently adopted, in a modified form, his plan of shareholding by the workmen, as an adjunct to profit-sharing. The men were offered £500,000 of 7 per cent. preference stock at a discount of 17½ per cent., to be allotted proportionately to their status, and paid for by monthly instalments. It was subscribed for twice over, and a further £400,000 of stock was subsequently allotted; so that the workmen now hold nearly £1,000,000 of capital between them. In addition to the interest payable, each man will receive an annual bonus proportionate to his holding; and it is further provided that, after the profits of the undertaking reach a certain level, a percentage is to be set aside out of which the Board of Management will award bonuses to the employees as a reward of merit and not *pro ratâ*.

Let us hope that the lead thus given by the largest industrial undertaking in the world may inspire many other employers to follow, and that, in Mr. Carnegie's words, "we may look forward to the day when it shall be the rule that the workman is partner with capital, the man of affairs giving his business experience, the working man in the mill giving his mechanical skill, to the company—both owners in the shares, and so far equally interested in the success of their joint efforts, each indispensable, without whose co-operation success were impossible."

THE ENCOURAGEMENT OF ZEAL.

A POINT to which reference was made in the "JOURNAL" a fortnight ago, *apropos* the Mosely Commission—namely, the inaccessibility of some employers to workmen with ideas—is of sufficient importance to warrant being further emphasized; and its consideration naturally leads to another subject of equal moment to the gas industry, especially at the present period of its history—the encouragement of originality and initiative in administrative as well as executive work. The industry wants, not only workmen with ideas for improving or cheapening the various processes involved in gas manufacture and distribution, but also administrative officers with alert minds eagerly seeking for new methods whereby to increase the popularity of gas in all the possible quarters in which it can be profitably used. It is to be feared that some of the administrators of gas undertakings do not sufficiently realize the vast difference that it makes in the prosperity of a business whether all hands who have the true grit of men in them are constantly thinking out how the machine can be made to work more efficiently and economically—are spending their energies and minds as freely upon the business as if it were their own—or whether they are simply doing what they are told just well enough to keep out of trouble. If, however, it be contended that all managements realize what is involved in such a difference, then it must be said that some among them are sadly wanting in the ability to induce the zealous initiative which they recognize to be necessary in their servants. And we take leave to say that, wherever such zeal and originality are conspicuously wanting in the subordinates, the fault is to be found in the management.

What we have compendiously termed "zealous initiative," is a plant of sensitive growth. In the right atmosphere, it soon develops, and becomes strong and healthy. In an unfavourable atmosphere, it rapidly becomes sickly and feeble, and is very likely to die away entirely. The most successful manager is he who naturally creates the stimulating atmosphere; he whose breath is withering to the plant of originality is certain to be a failure. How can the principals of a business know whether their managers are among the stimulators or the dampers of enthusiastic originality in their subordinates? Well, there is one sure sign of the man who has the stimulating influence. He will be always speaking about the men below him. "Mr. So-and-so has made a suggestion that I think we should do well to adopt." "Mr. Blank has hit upon a very good plan indeed which will save us money in the retort-house." "I was discussing our system of pushing the use of cooking-stoves with our outdoor manager the other day, and we agreed that," &c., &c. Those are the sort of remarks that the man who has the gift of encouraging initiative will be heard making to his principals—for nothing encourages a subordinate to make a suggestion so much as to know, first, that he will get a patient hearing from one who is anxious to adopt it if it be good, and, secondly, that if it should be adopted its authorship will be recognized, if not directly rewarded. On the other hand, the manager who either receives suggestions as if they were impertinences or adopts them without acknowledgment, will soon find that his staff have very few to make—and his principals will wonder why the business hangs fire, and is left behind by its rivals.

There is another point. Initiative, as has been remarked, is a very sensitive plant; and it can be injured in its growth, not only by the cold breath of discouragement, but also by the excessive interference of head officials in the details of the work of their subordinates. It has been truly said that it is sometimes even better, in cases not of supreme importance, to accept from a subordinate a recommendation not absolutely perfect, than to discourage him by too minute supervision. Every man who is any good at all is all the better for a sense of responsibility—a feeling that his work is recognized as useful, and that, within reasonable limits, he is trusted to carry it out. Where every man must keep within the precise bounds of literal instructions, he will also keep only too well within the bounds of his possible usefulness. Administrators of gas undertakings should look to it that the good work done or the originality displayed by zealous officers is acknowledged and on occasion rewarded; and that

responsibility is delegated to a reasonable extent—not confined to one or two men. He who manages too much does not manage too well.

INTERNATIONAL COMMISSION ON PHOTOMETRY.

We have received from M. Ph. Delahaye, the General Secretary of the above-named Commission (which, it may be remembered, was constituted on the occasion of the International Gas Congress in Paris in 1900), a circular notifying that the Commission will meet in Zurich from Friday, the 19th, till Monday, the 22nd of June. The English members of the Commission are Mr. Charles Carpenter, Mr. J. W. Helps, Professor Lewes, and Mr. T. O. Paterson; while Dr. G. Love represents America. The names of the other members have already been given in the "Journal," and the scope of their labours has been indicated. It may be mentioned, however, that the programme sent to them by the President (M. Th. Vautier) contained seven subjects for their consideration. The first was incandescence; and the object was to elicit opinions as to the causes operating to produce the light obtained by this means. The next two subjects dealt with photometric standards and rules; the idea being to ascertain the relative values of the carcel and hefner lamps, the ten-candle pentane lamp of Mr. Vernon Harcourt, the one-candle pentane lamp, the German paraffin candle, and the English spermaceti candle, and to consider the rules to be observed in measuring the illuminating power of incandescent gas-burners, independently of standards of light and photometers. The fourth subject was the calorific power of coal gas, and its effect on the luminous intensity of incandescent burners. It was suggested that experiments should be carried out with the view of finding a solution of the following question: When the intensity of a burner supplied by gas of known calorific power has been measured, how is it possible to ascertain by calculation the intensity this burner would produce if consuming gas of different calorific power, taken as the normal power? The remaining subjects were the production of a typical burner for testing mantles, the effect on the latter of their constituent elements, and the unification of screw-threads in the various appliances used in the distribution of gas.

The preliminary programme for the Zurich meetings shows that some of the most important of the above subjects will come under consideration. Dr. Bunte will present the result of his investigations into the comparative values of the various standards mentioned in the second subject. M. Sainte-Claire Deville, the Chief of the experimental works of the Paris Gas Company, will deal with the effect of calorific power in producing variations in the lighting value of incandescent gases; and M. Vautier will submit some researches on the subject of the resistance of mantles, ascertained by means of a measuring instrument. The question of the unification of screw-threads for gas appliances will be discussed by M. Payet, a former student at the Polytechnic School in Paris, and the Record Keeper to the Société Technique du Gaz en France. Other communications are expected on various questions indicated in the list of subjects proposed to the members of the Commission.

We learn that, in addition to the German Association of Gas and Water Engineers, the Swiss Association will hold their meeting in Zurich from the 23rd to the 26th prox.; and both Societies have expressed a desire that the members of the Photometrical Commission should be present on the occasion.

Danger of Sulphate of Ammonia Saturators.—At the last meeting of the Nottingham Section of the Society of Chemical Industry, Mr. F. J. R. Carulla, of Derby, communicated a note on "A Hidden Source of Danger in Sulphate of Ammonia Saturators." It was intended to serve as a caution to other manufacturers for the prevention of an accident which had fortunately resulted without injury to anyone. It was the overflowing of the hot acid liquor from the saturator well, with almost explosive violence, which had recently occurred in the author's experience, and the cause and remedy were considered in the note. Mr. Carulla expressed the opinion that no saturator is absolutely safe without an appropriate safety-valve.

The New Simmance-Abady Photometer.—A demonstration of the new Simmance-Abady photometer for measuring the actual intensity of incandescent gas-lights, the electric arc, daylight, and other variously tinted sources of illumination in English standard candles, was made at the Royal Institution, in Albemarle Street, last Friday evening, and attracted much attention. The exhibition principally comprised the testing of brilliantly coloured lights—such as vivid scarlet, green, orange, blue, &c., and in all cases an absolutely clear reading was obtained. Some testings of Kern-Welsbach burner mantles gave very high results; and although the apparatus was closely inspected by eminent scientists, including some well-known engineers of London Gas Companies, it passed through the ordeal quite satisfactorily. It was, in fact, demonstrated (it was said) beyond dispute that it is now possible to make tests of lights of various tints with absolute accuracy. This photometer was fully described in the "Journal" for April 21.

THE COMPARATIVE LIFE OF HORIZONTAL AND INCLINED RETORTS.

A Few Criticisms of Mr. Herring's Figures.

The return which Mr. W. R. Herring recently made to the Edinburgh and Leith Gas Commissioners, as to the comparative working life of horizontal and inclined retorts, has aroused considerable interest and (to repeat the expression employed last week) astonishment among gas engineers, who appear to be totally lost for a reason as to why the Edinburgh horizontal retorts have had such a short span of life. In the leaderette on the subject in last week's issue, the remark was made: "We are under the impression that cases will be found that do not altogether bear out Mr. Herring's remarkable testimony as to the superior working life of inclines in comparison with horizontals." Here are a few.

DERBY.

Mr. J. Ferguson Bell, of Derby, contributes the following letter: "Under the 'Technical Record' in the 'Journal' last week, you give an account of the life of horizontal retorts at the Edinburgh and Leith Gas-Works, which I venture to think is confined to the works named. However this may be, it certainly does not represent anything at all approaching the normal life of gaseous fired horizontal retorts in most gas-works, which varies from 1000 to 1200 actual working days, and upwards. In other words, it would appear from the return that horizontal retorts at the works named are renewed after less than twelve months' continuous work, which is an extraordinarily short life. It is early yet to premise the relative life of inclined retorts compared with horizontals; but no comparison based on anything less than 1200 working days will be accepted by most engineers as a standard for the latter. Surely there must be some special circumstances which will account for so short a life as only 354 days at the Edinburgh and 340 days at the Leith Works. This is only about half the life of horizontal retorts under the old direct-fired system; and, as a rule, this is doubled by modern gaseous fired settings."

LEAMINGTON.

Mr. Thomas Berridge, of Leamington, writes: "The average life of the horizontal retort at these works is over 900 days. One really cannot, therefore, understand Mr. Herring's figures of 354 days only."

HASTINGS.

Mr. C. E. Botley, of Hastings, says: "The last section of retorts which were renewed here had a life of 850 working days, during which time each retort carbonized upwards of 1100 tons of coal per 20-feet length."

LEICESTER.

Mr. Alfred Colson, of Leicester, writes: "Your suggestion that Mr. Herring's communication to the Edinburgh and Leith Gas Commissioners with reference to the above subject will perhaps create astonishment among gas engineers is, I think, likely to prove correct. That, as a standard of comparison as to durability, the life of horizontal retorts should be taken at 354 days certainly astonishes me. Surely so short a life as that taken by Mr. Herring does not generally obtain in the country. I give my own experience. It is many years since the retorts (all horizontal) at our Aylestone Road works, heated by regenerator furnaces, actually worked less than 1000 days; generally 200 days before being let down for repairs. At the present time, we have at these works retorts carbonizing and doing excellent service that have already worked from 1100 to 1300 days, producing 9500 cubic feet per mouthpiece, and 11,000 cubic feet per ton of coal. At the Belgrave Gate works, there are retorts (smaller than those at Aylestone Road), heated by generator furnaces, that have worked over 1600 days, and are now producing 7500 cubic feet per mouthpiece, and 11,000 cubic feet per ton of coal. These same retorts will last at least another 200 days. The life of horizontal retorts, if heated by generator furnaces, I should say is from 1600 to 1800 days; if heated by regenerator furnaces, from 1300 to 1500 days. Mr. Herring's inclines have run 782 days, but are 'still in working order;' their life has yet to be determined."

SHEFFIELD.

Mr. Hanbury Thomas, of Sheffield, says: "Referring to the leaderette in your issue of the 5th inst., the most remarkable feature of the Edinburgh figures appears to be the short life of the horizontals. My Company keep a record of the dates of lighting up and letting down of each bed of retorts; and I find that at our last new works (Grimesthorpe), where we started making gas in November, 1898, with fifteen beds of tens (clay retorts) and West's stoking machinery, the life has been as follows: Of eight beds renewed last summer, six were in actual use 852 days; and two 1053 days. The remaining seven beds, which will be renewed this summer, but are still working, have been in use 1266 days. At our other works, where we have stoking machinery in operation, brick retorts are employed; and there are some still in use which have been at work upwards of 3000 days."

THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

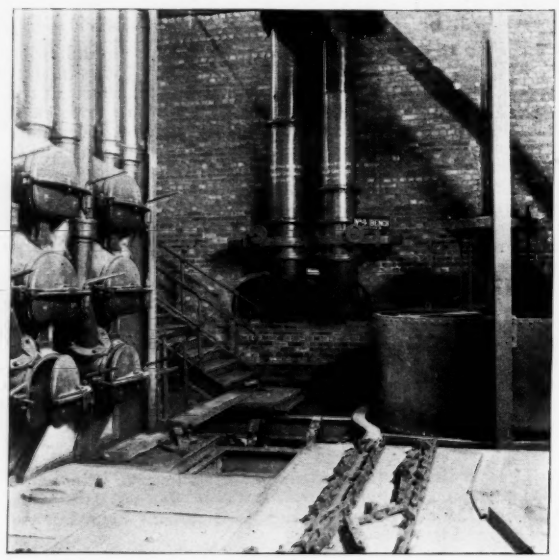
DESCRIPTION PREPARED

BY

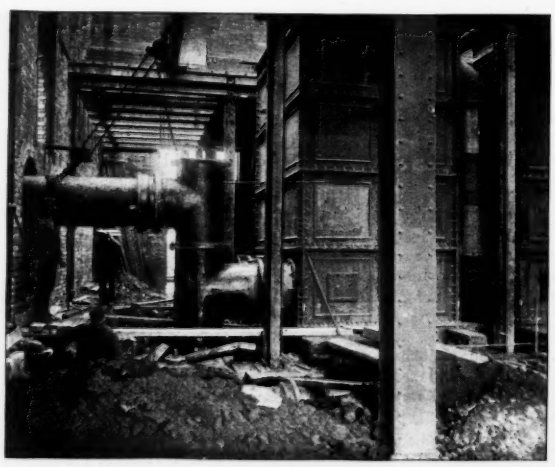
WALTER RALPH HERRING, M.INST.C.E., *Engineer.* *

ARTICLE XVIII.—Accompanied by Plate No. 19, showing the Plant and Machinery in the Annexe to the Retort-House, including the Hydraulic Power Appliances, the Engines for the Coal and Coke Handling Plant, the Condensers, the Exhausters, &c.

The gas, upon leaving the retort-house in four streams of 20-inch pipes, is at the southern end of same made to converge into two streams each to a 30-inch pipe. Thereafter the whole plant is divided into two 5 million cubic feet sections, with 30-inch connections



PHOTOGRAPH No. 88.—Illustrates the two pipe-lines from the foul-main condensers converging into one 30-inch main.

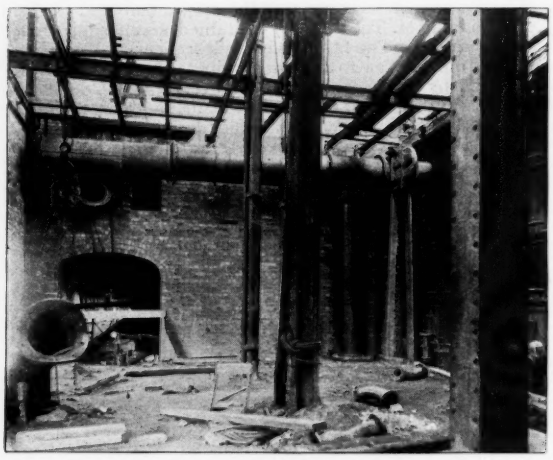


PHOTOGRAPH No. 89.—Outlet from the water-tube condensers, and inlet to the exhausters, with the bye-pass connections.

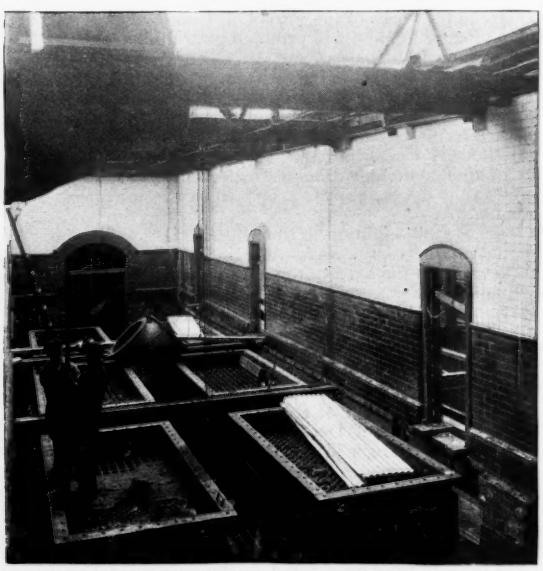
connected to a 30-inch main common to both. Photograph No. 88 illustrates this pretty clearly. The 30-inch main in question is the inlet main to a battery of three towers of Clapham's water-tube condensers; the inlet being at the top of the third tower, and the outlet at the bottom of the first tower, as illustrated in Photograph No. 89. The descending main seen in Photograph No. 90 is the bye-pass main from the apparatus.

Each battery of condensers has three towers; each tower having a combined cooling surface of 8070 square feet, in addition to which there is an air-cooled surface of 1500 square feet. In all there are 6½ miles of 1½-inch diameter tubing, through which the water is made to flow. Each tower consists of a chamber 4 ft. 6 in. wide, by 9 feet long, by 20 feet high. At the bottom of each tower there is a lower water-chamber, 4 ft. 6 in. by 9 ft. by

Two 20-inch diameter foul-mains on either side of the retort-house, after winding backwards and forwards under the eaves of the roof, descend on the inside of the gable wall; passing through it at a point a little above the drawing-stage level, where a valve has been placed on each, and thereafter, by means of a bend, are



PHOTOGRAPH No. 90.—Shows the 30-inch foul main from the retort-house condensers to the water-tube condensers and the bye-pass connections.



PHOTOGRAPH No. 91.—The upper chambers of the water-tube condensers, the plates forming the floor of the corridor communicating with the exhauster-house, retort-house, mess-rooms, &c.

2 ft. 3 in., composed of cast-iron side and bottom plates with planed joints; the side plates having suitable manholes and covers, &c., for access.

A perforated plate for supporting the tubes is here inserted; and above this the tower—consisting of a chamber 16 ft. 6 in. high, of the same breadth and length—is constructed, and through which the water tubes pass. This tower is really the gas-space in the condenser.

Each tower is fitted with 338 gas-tubes—1½ inches internal diameter, 16 ft. 10½ in. long. Each tube rests upon a round nut, screwed on to the lower end of the tube; the screwed end of the tube passing through the bottom perforated plates of the gas chamber. The joint is made water-tight top and bottom by means of jute washers, soaked in red-lead cement, with back-nuts

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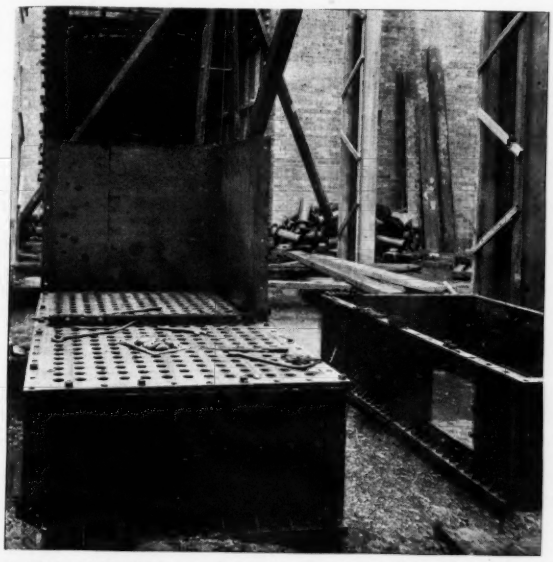


PHOTOGRAPH No. 92.—The water-tube condenser and bottom water chamber, with the tube-plate in position.

PHOTOGRAPH No. 93.—The seal-pot and syphon-pipes communicating from the retort-house, condenser house, and exhauster house.

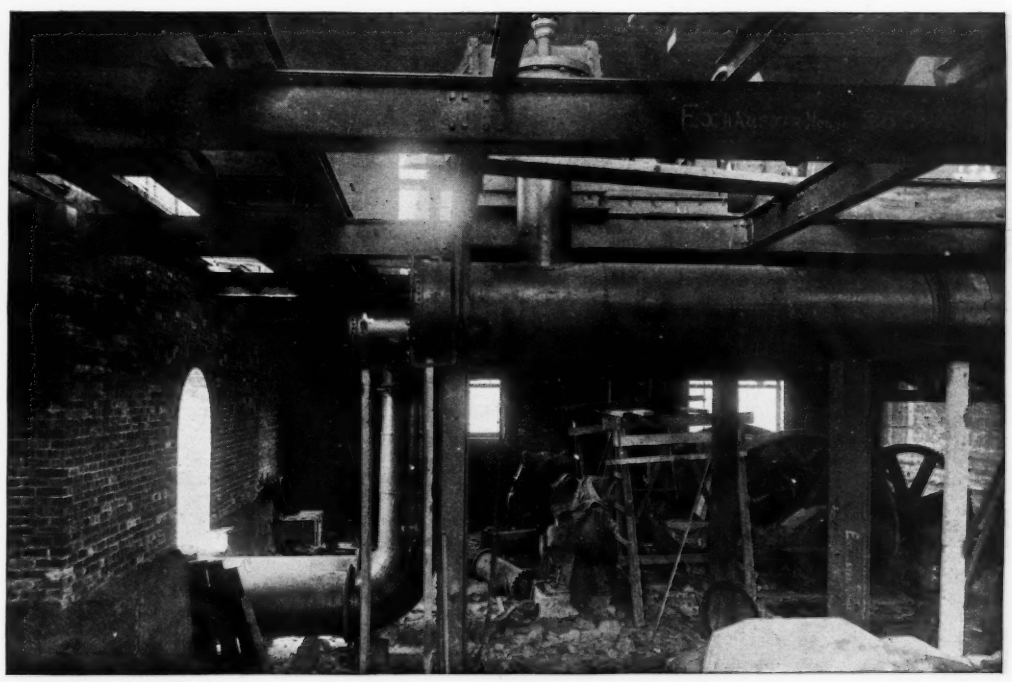
screwed on to the ends of the tubes projecting into the lower water-chamber. The upper ends of the tubes are jointed by means of Clapham's patent stuffing-box and glands, by which means any tube can be taken out and replaced in a very short period of time, without disturbing the next.

The upper water-chamber—seen in Photograph No. 91—is covered with cast-iron plates, and forms part of the flooring of the gangway between the exhauster-house and the retort-house.

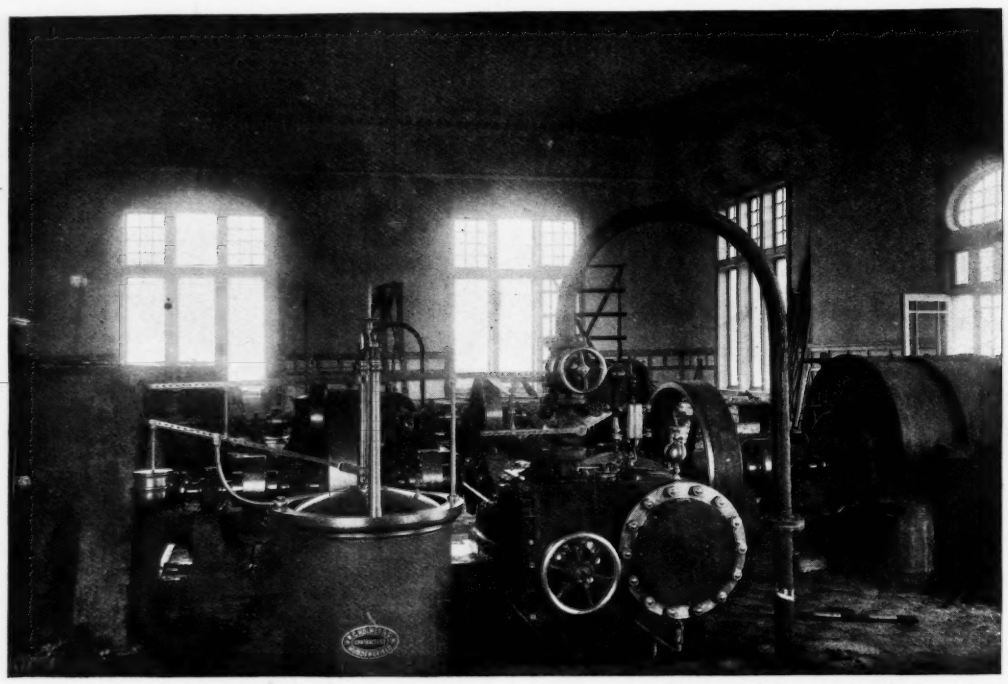
The gas connections (as already explained) enter the top of the third chamber, and by means of rising mains between the towers—also partly seen in Photograph No. 89—pass out from the bottom of the third chamber to the top of the second, from the bottom of the second chamber to the top of the first, and from the bottom of the first chamber (as shown upon Photograph No. 89) to the exhauster-house. The bye-pass connections are laid alongside the towers, and connect as shown on Photograph No. 89. The fresh-water inlet is attached to the bottom water-chamber immediately alongside the gas outlet—the water flowing up the first chamber and by means of a pipe communicating from the top of the first chamber to the bottom of the second, from the top of the second to the bottom of the third; the outlet connection from the top of the third chamber being conducted to one of the two water-tanks overhead. The water supply for the works is thus first utilized for condensing or cooling the gas. The total pressure upon the base of the condenser water-chamber is about 17½ lbs. per square inch; and, in order to strengthen them, they have been embedded in the concrete for nearly their total depth (see Photograph No. 92). The pressure in the upper water-chamber of the condensers is about 11 lbs. per square inch.

The condensation from each tower, as well as from the bye-pass main, is conducted by means of 6-inch pipes to the outside of the building, where the pipes are sealed in a syphon-pot common to this section of the works. Photograph No. 93 shows the pot immediately on the outside of this block of buildings, and from which an overflow communicates with the tar and liquor separating tank, at the south end of the plant-house. This chamber is subsequently covered with open gratings, so that any blowing of seals or escaping vapour finds immediate access to the atmosphere, and thus danger from fire and explosion is avoided.

Immediately on leaving the water-tube condensers, the gas passes into the mains suspended beneath the exhauster-house floor, where the arrangements are such as shown on Plate 19, which permit of the streams of gas being continued separately or reunited and sent through one set of exhausting plant or diverted to the opposite set at will. The exhausters (as before stated) are placed upon an upper floor. Photograph No. 94 shows a portion of the connections, and also the exhausters in position on the upper floor. The exhausting plant has been supplied by Messrs. R. Laidlaw and Sons, of Glasgow. It comprises two complete sets, each set consisting of two exhausters with steam-engine common to both, connected by means of couplings, and



PHOTOGRAPH No. 94.—Beneath the exhauster-house; illustrating the inlet and outlet connections.



PHOTOGRAPH No. 95.—The exhauster-house, showing the exhausters and machinery in the interior.

arranged in such a manner that the engine belonging to one set can be made to drive the exhausters on the opposite set, by means of belts—one or both of them, either independently of those attached to its own bed-plate or conjointly with them.

In all, there are four exhausters of Laidlaw's latest three-bladed type; each exhauster being guaranteed to pass 200,000 cubic feet of gas per hour at a speed of 60 revolutions per minute, against a total gas pressure of 30 inches. Each of the three blades in this type of exhauster operates alternately on the outer and inner chamber of the revolving barrel, by which means the capacity of the apparatus is increased about 35 per cent. Each exhauster cylinder is 4 feet inside diameter by 3 ft. 6½ in. long. Photograph No. 95 gives some illustrations of this apparatus.

Each of the steam-engines is of the horizontal non-condensing type, with cylinder 17 inches diameter by 22 inches stroke by 60 revolutions per minute; and each is capable of driving the four exhausters at their maximum work at a pressure of 80 lbs. per square inch of steam. They are fitted with variable expansion gear.

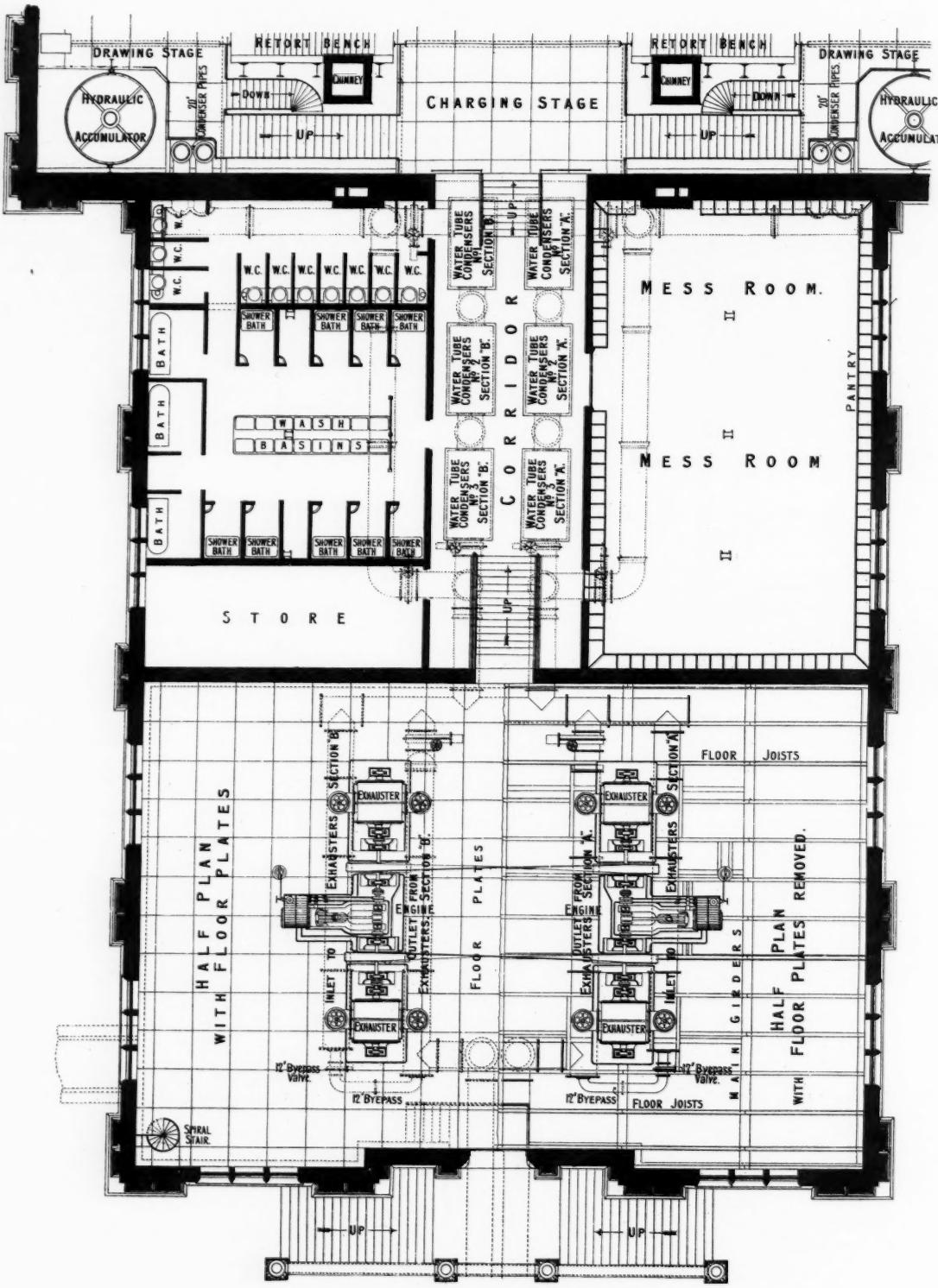
The general arrangement of exhauster connections, together with the automatic bye-pass valves, &c., will be easily understood upon a reference to Plate 19. The gas, upon leaving the exhauster-house, descends as shown on Photograph No. 94, and passes in two streams beneath the staircase leading into the basement below. This room is used for accommodating the driving engines actuating the coal and coke handling plant, as well as the duplicate set of hydraulic pumping machinery. The engines for actuating the coal-handling plant are also in duplicate. It has before been stated that the basement of this room is sunk below the yard level a distance of 6 ft. 6 in., to permit of the line shafting communicating with the coal-breakers and elevating plant and the coal-handling plant, a distance of 600 feet away; being laid in a shaft-trench beneath the retort-house floor without interspersing gearing that could be otherwise avoided. The foundations, and the method of constructing the same, for these engines will be appreciated by reference to Photograph No. 96; the engines themselves, under process of erecting, being shown on Photograph No. 97. These engines are of the Corliss type, and are of Messrs. Marshall's make, supplied by Messrs.

PHOTOGRAPH No. 96.—The concrete foundations for the coalbreaker and elevator engines, with stone-blocks in position.

The Granton Works of the Edinburg

Plant and Machinery in Annexe to Retort-House—including the Hydrauli

Plant, Condensers, E

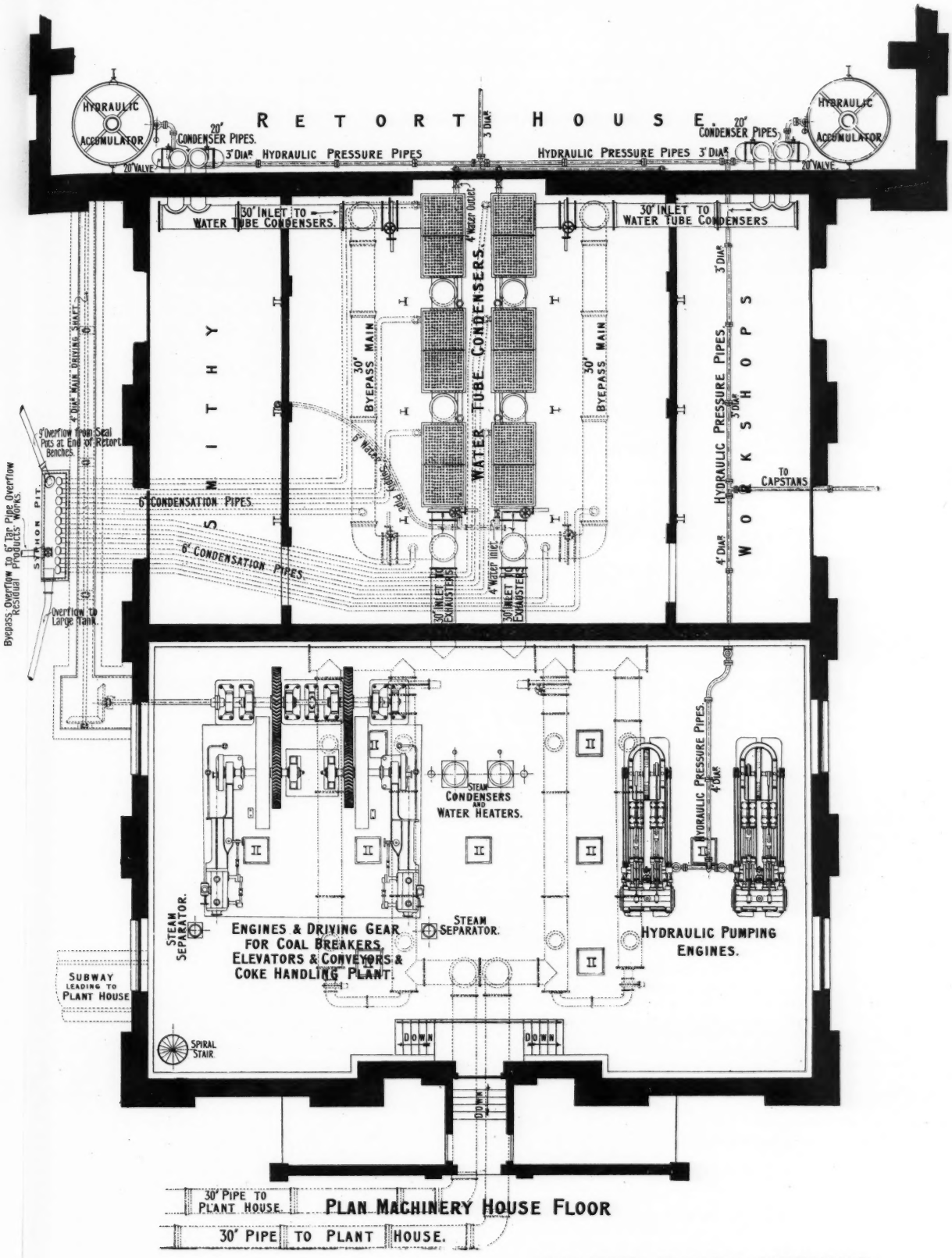


PLAN EXHAUSTER HOUSE FLOOR.

Copyright at Stationers' Hall.

No. 19.

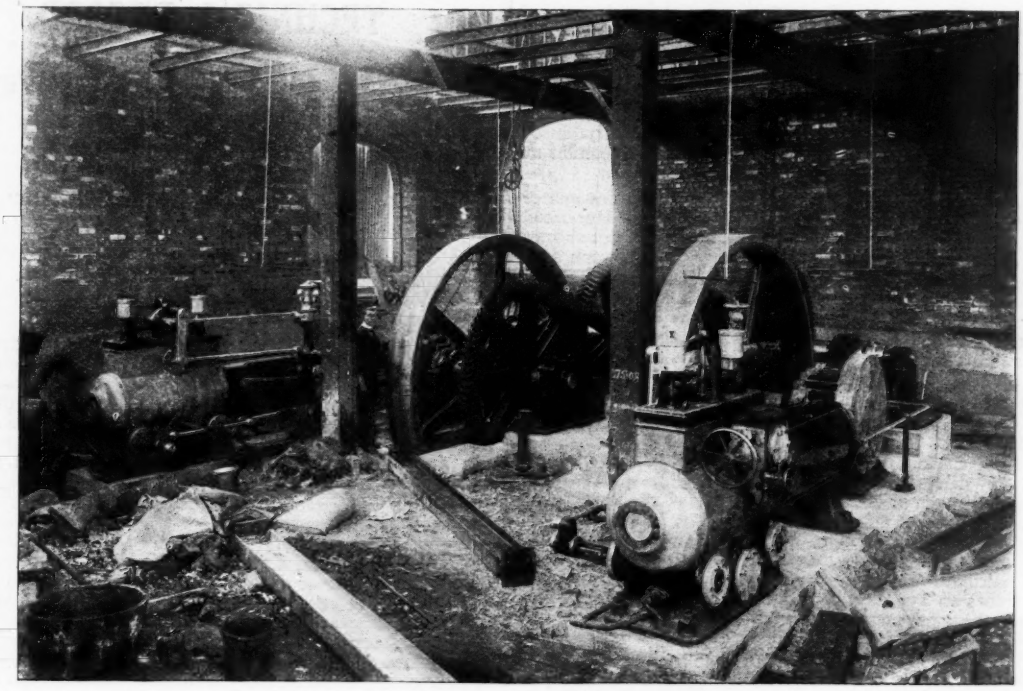
Hydraulic Power Appliances, the Engines for the Coal and Coke Handling ensers, Exhausters, &c.



PLAN MACHINERY HOUSE FLOOR

WALTER RALPH HERRING,

M.INST.C.E., *ENGINEER.*



PHOTOGRAPH No. 97.—The coal breaker and elevator engines in process of erection.

Graham, Morton, and Co., the Contractors for the entire carbonizing plant. In the same building, the duplicate set of hydraulic pumping machinery (Messrs. Tannett-Walker's make) has been accommodated. The accumulators for these engines are placed in the corners of the retort-house, where they are protected from atmospheric influences, and in no way inconvenience the operations in the retort-house.

The hydraulic appliances actuate the railway capstans and the waggon lifts, as well as supply power to the purifying-house, and what little is required for actuating the slides of the coal measuring chambers in the retort-house.

The hydraulic power apparatus consists of two pairs of horizontal direct-acting and rotative steam-pumping engines with 14-inch diameter cylinders, 21 inches stroke, fitted with expansion gear and patent controlling apparatus, and having two double-acting water-pumping cylinders on each. There are two hydraulic accumulators, with 14-inch ram and 14-feet stroke, with circular steel drum, 9 ft. 6 in. diameter, for loading material; the working pressure being 750 lbs. per square inch.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 391.)

BUSINESS on the Stock Exchange last week showed a favourable tendency. Consols were on the rise; and the tone in general was fair. But as the week went on, things clouded over considerably; and the Manchurian alarm towards the close had a sinister effect. From the moment of the issue—and, indeed, some time before the issue—of the Transvaal Loan, all other business was almost abandoned; and the rush to get a slice of a "cheap thing" was pretty well a record one. The amount of the applications will probably run to many hundreds of millions. The Money Market has, of course, actively profited by the enormous demand in connection with it. Discount rates were steady; and though in some quarters the long deferred reduction of the Bank rate was confidently expected on Thursday, it was perhaps too much to expect a reduction at such a time of pressure for money. Business in the Gas Market was more active and more interesting than it has been for some time. The tendency generally was favourable, and some good advances in quotation were made, chequered only sparsely with a few retrogressions. The bulk of the business was in Gaslight and Coke ordinary, which, opening at 83¼, was rushed rapidly up until on Thursday it changed hands more than once at 89⅜. Here it stopped, and began to come down again; the final mark being 88. The causes of this phenomenon are as obscure as those of similar phenomena usually are. Some attribute it to approaching changes in the administration, which is impolite and improbable. Others with more reason point to the Company faring better in the Parliamentary Committee-room than was expected. This is firmer ground to stand on; but the fact is that the market recks little of all these things, and prices move up and down—well, we do not know how. However, the quotation of the ordinary netted a gain of four points, and the preference gained one. South Metropolitan was more active, and the price was better; 120 being frequently marked. Commercials were rather oddly treated—more mysteries on a small scale—and the price jumped about as if pulled by a strong hand. In the Suburban and Provincial group, business was very quiet, with good prices. Brentford new advanced a point, and so did Liverpool in its local Exchange. The Continental Companies were very quiet, and gave no indication of a disposition to move. In the remoter world, the South American undertakings again were conspicuous. The Water Companies have not shown much activity generally; but an interesting incident was the announcement of a 10 per cent. dividend in Grand Junction. This sent the quotation up freely; but it did not seem quite high enough yet to tempt sellers inside the market.

The daily operations were: Gas opened brightly on Monday. Brentford new rose 1, and Buenos Ayres ¼; but River Plate fell ¼. On Tuesday, there was great activity in Gaslight issues, and the ordinary rose 1. Activity was maintained on Wednesday, and Gaslight ordinary rose 3; but Commercial fours fell 1. In Water, Grand Junction rose 7. Thursday's operations were similar, and Gaslight ordinary rose 1. Grand Junction Water rose 2. Friday was quieter; but Gaslight preference rose 1. Grand Junction Water rose 3. On Saturday, there was a turn, and Gaslight ordinary fell 1; but the debentures of Buenos Ayres and River Plate rose 1 each.

A Semicircular Dam.—At the southern end of Lake Cochituate, the original source of Boston's water, and from which 15 per cent. of the water for the Metropolitan District is still taken, is an area of shallow water covering about 80 acres. This is now a part of the lake; but more than sixty years ago, before the water had been raised by dams, there were at this place meadows of which the surface was but slightly above the water in the lake. By successive raisings of the lake, the high-water mark was lifted 7 feet; so that when the lake was full there was a depth of 5 or 6 feet over the meadows. More than half of the total watershed of the lake is tributary through these meadows; and realizing that shallow water deteriorates, the Boston Water Board constructed a regulating dam, a view of which was given in a recent number of the "Engineering Record." The semicircular shape was chosen, in order to obtain a great length of overfall, and thus avoid backing the water up too high. It has a core wall of 6-inch tongued and grooved sheeting, driven on a circle of 30 feet radius. On the up-stream side, the sheeting is backed with gravel, having a slope of 2 to 1; while the down-stream side is filled with stone, heavily paved on the surface. A sluice 6½ feet wide was built through the dam, containing stop-planks by which the water may be retained at any desired height. When the water stands at high level, the dam is entirely submerged; but when the lake is drawn down, the dam retains the water upon the meadows. This dam was the forerunner of the regulating dam in the Sudbury reservoir, built in 1896 by the Metropolitan Water Board. The latter is nearly a complete circle in plan.

PERSONAL.

Mr. S. C. CHAPMAN, Assoc.M.Inst.C.E., of Jersey, was on Tuesday last appointed Water-Works Engineer to the Torquay Corporation, in succession to Mr. W. Ingham, who, as already announced in the "JOURNAL," has obtained the appointment of Hydraulic Engineer at Port Elizabeth. Mr. Chapman filled a position at Plymouth before his removal to Jersey.

After nearly fifteen years' service as Engineer and Manager of the Halifax Corporation Gas-Works, Mr. THOMAS HOLGATE, M.Inst.C.E., F.C.S., has resigned the position, and will shortly open an office in London and continue professional work as a consulting engineer. During the time Mr. Holgate has been at Halifax he has constructed a large and complete new section of gas-works there, as well as new chemical works. He was the last President of the Institution of Gas Engineers; and his Inaugural Address at the opening of his year of office was one of the most studious and comprehensive of the compositions which have of late been given to the gas industry from any presidential chair.

It was with unfeigned regret that the proprietors of the Imperial Continental Gas Association heard, at their half-yearly meeting last Tuesday, that the absence of their Chairman, Mr. T. H. GOODWIN NEWTON, was due to ill-health. A day or so later, the intelligence was received that Mr. Newton had resigned, and that, at the Board meeting on Wednesday, Mr. J. HORSLEY PALMER, the Deputy-Chairman, had been elevated by his colleagues to the chair, and Mr. ARTHUR LUCAS appointed to the Deputy-Chairmanship. For forty years, as Mr. Palmer told the proprietors on Tuesday, Mr. Newton has given his very best attention to the affairs of the Association; and to this it may be added that in manner, word, and deed, the late Chairman has ever shown the high importance that he attached to his office, in the duties of which he has been thorough to a degree that could not be surpassed. He was honestly proud of his position; and he was a Chairman whom the proprietors delighted to honour.

Presentations of Medals.—At the annual spring meeting of the Iron and Steel Institute, which opened in London last Thursday, Sir James Kitson, Bart., M.P., was presented by the President (Mr. Andrew Carnegie) with the Bessemer Gold Medal. The two gold Hofmann medals, established in 1888 in connection with the 70th birthday of the well-known chemist, August Wilhelm von Hofmann, for award to some distinguished foreign scientist, have been conferred by the German Chemical Society upon Professor Henri Moissan, the well-known French chemist, and Sir William Ramsay.

Origin of Natural Gas and Petroleum.—A correspondent of "Nature" calls attention to the fact that the volcanic origin of natural gas and petroleum is strongly advocated by Mr. Eugene Coste in a paper recently read before the Canadian Mining Institute. The author points to the complete analogy of the products of the oil and gas fields with the products of volcanic solfataric action. These products are water, chloride salts, sulphur, sulphuretted hydrogen, carbonic acid, and hydrocarbons. He brings forward facts upon which he bases his view that all the petroleum, natural gas, and bituminous fields or deposits are essentially the products of solfataric volcanic emanations, condensed and held in their passage upward in the porous tanks (sands, limestones, &c.) of all ages from the Archæan to the Quaternary. The oil shales through which the igneous rocks have intruded were in Mr. Coste's opinion impregnated by solfataric emanations, for their bituminous character is local, and in proximity to the igneous rocks. Natural gas and petroleum are associated with mud volcanoes. The author therefore concludes that carbon and hydrocarbons are derived from deep-seated fluid magmas, in which they exist probably in the form of carbides.

The Spectra of Flame.—Our readers are aware that there are two principal parts in a flame—the interior cone, or nucleus, and the flame itself, which is outside the cone and encloses it. M. Gouy has discovered spectral rays in the nucleus of the flame, produced by the combustion of a mixture of coal gas and air charged with a metallic salt dust. These rays, which belong to the spectrum of the metal in question, may not be visible in the flame itself, and do not appear, when a salt is simply introduced into it from without. According to the "Comptes Rendus," M. de Watterville has continued this investigation into the ultra-violet end of the spectrum, and also to ascertain whether certain rays, too feeble to be perceived by the eye, could be recorded by photography. He not only confirms the results previously found, but considerably extends them. It may be asked: What is the cause of the difference between the spectra of the two parts of the flame? Is it due to a difference in the temperature of the two zones, or to the fact that possibly transformation of the saline compound, in its passage from the reductive medium to the oxidating one, liberates, for a brief period, at the surface of the cone, a metallic fume, at a lower temperature than that at which it usually exists? However this may be, the spectral phenomenon in the flame is of calorific origin; and considering the similarity of the two spectra, it is probably the same in the oscillating spark. This, at all events, is the author's opinion.

TECHNICAL RECORD.

PROGRESS IN THE GAS INDUSTRY.

From an American Standpoint.

DISTRIBUTION.

Continuing the extracts from Mr. Irvin Butterworth's report to the Ohio Gaslight Association, on the progress made in the technical work of the gas industry during the past five years, we give to-day *in extenso* the section dealing with distribution.

STREET MAIN GOVERNORS.

Automatic street main governors have been improved as follows: (1) A safety or balance governor is now being placed ahead of the usual automatic governor for the purpose of delivering gas to the latter at a constant pressure, being usually that thrown by the top lift of the holder alone. This enables the automatic governor to do its work much better than has heretofore been possible under the varying initial pressures due to the uncupping of three-lift and four-lift holders. (2) Governors put on large outlets to new gasholders while the consumption from them is as yet small, are now provided with temporary rings around the governor-valves, restricting the openings so that small valves can be used. Then, when the consumption increases sufficiently, these rings are removed, and large and permanent valves are substituted. This does away with the old method of first installing a small-sized governor, and later a larger one. (3) A glass vessel is now used instead of iron for containing the mercury, enabling the operator to readily see what is going on. (4) One chamber is now used for the mercury instead of three or four, as heretofore; and the mercury is adjusted to different heights by means of a movable displacement block, simplifying the governor, and making it possible to properly adjust it the first night that it is put into use.

HOUSE-PRESSURE REGULATORS.

With the tendency toward high-pressure gas distribution, the individual pressure regular for houses becomes even a more important device than heretofore. There are numerous makes upon the market; and the best ones are being improved as the years go by, although no recent improvements have been radical or especially noteworthy. The valve mechanisms have been simplified and cheapened; and the sensitiveness, durability, and reliability of the governors have been increased. Most of these governors employ a metal float or leather diaphragm, to which is attached a vertical rod for actuating the valve. This rod is generally supported and held in position by passing through rather tight fitting openings, which are liable to stop up with naphthalene and other deposits, thus impeding the movements of the rod, and interfering with the proper working of the governor. Some concerns are now supporting this rod by means of chains and other anti-friction devices; thus permitting the openings through which the rod passes to be so large that they do not stop up. The leather diaphragms formerly became dry and hard in time, as one side of them is necessarily exposed to the air. But one concernn ow keeps the diaphragm submerged in oil, which obviates this difficulty. Governors are now made that are very efficient, reliable, and not liable to get out of order. One is reported that has been in constant use for four years without having required any attention whatever, and is still as sensitive and as accurate as when first installed. This is probably not an exceptional case.

CONSUMERS' METERS.

During the period under consideration, there have been no improvements in the ordinary house meter, beyond the usual gradual perfecting of parts and of methods of manufacture that are bound to result in the lapse of time, from the conscientious efforts of manufacturers to better even so perfect and time-honoured a device as the justly respected gas-meter. Many efforts have been made to depart with advantage from the Glover type of meter that has held sway, virtually in its present form, for the past 50 or 60 years; but thus far without noteworthy success. Another such attempt has recently been made by an Eastern firm; their proposed meter having a cast-iron case and rotary valve—the upper half of the valve being made of ground glass. This meter is being tried experimentally. It is neat and compact in appearance, and promises at least the possibility of greater durability, and of greater capacity per unit of cost, than the ordinary tin meter. In England, Mr. Thorp has recently introduced a decided novelty in the shape of a rotary meter, which operates on the principle of the anemometer, and which is reported upon very favourably thus far by those who have tried it.

A straight reading meter dial, having, in addition to the usual dials and index figures, an arrangement whereby the figures constituting the correct reading of the meter appear at all times completely and plainly in view through openings in the dial plate, has recently been perfected; and meters equipped with them are about to be put upon the market at a slight advance in cost over that of the ordinary meter. This meter dial is greatly superior to those previously devised, in which the figures gradually revolve

into view, as in such dials the figures are at times only partially visible, resulting in misreading of the meter.

Iron meter connections are now being recognized as possessing numerous advantages over lead connections, which they are rapidly beginning to displace. The "Glass" complaint meter, perfected within the past five years, is now coming into general use, and furnishes gas companies with a most ingenious and useful means for convincing doubtful consumers that they are really burning the quantity of gas charged for on their bills. Progress is gradually being made in the use by gas companies of the standard meter threads adopted by the American Gaslight Association several years ago. There seems to have been no special improvement in lock stop-cocks for gas-meters; but a novelty in the shape of a meter lock has very recently been put upon the market by an Ohio concern that is claimed to prevent consumers from disconnecting or bye-passing their meters.

Some small improvements have been made in prepayment gas-meters; but no distinctly new types have so far been introduced. These meters, as now made, are less apt to get out of order than formerly, and some of the working parts have been made stronger. The cash-boxes have also been improved. But the most noteworthy improvement in connection with prepayment meters is a safety device, recently brought out, which is said to allow the light to dim down, when the gas paid for has all been consumed, so as to be insufficient for use, but which does not allow it to go out altogether until about fifteen hours have elapsed; thereby preventing accidents being caused by persons putting coins into the meter after the light has gone out, and so turning gas on in bedrooms where lights have previously been burning.

Tapping Machines.

Tapping machines have been very much improved; and in addition to other new features they are now so made that no gas escapes while the tapping is being done—thus saving gas, and avoiding the risk of asphyxiation.

Recording Pressure-Gauges.

The improvements in recording pressure-gauges consist in the perfecting of the parts, and increasing the variety and range of the gauges, so that they are now made to record anything between full vacuum and 10,000 lbs. pressure per square inch.

High-Pressure Gas Distribution.

One of the most important steps in the recent progress of the gas business is the distribution of artificial gas at high pressures, begun about three years ago, and now demonstrated to be a mechanical and economical success. About twenty high-pressure systems are now in operation throughout the country; and all of them are reported as giving satisfaction, and saving the owners' money, especially in the matter of interest charges. There is one high-pressure line in the east that is 12 inches in diameter, and 35 miles long. In Derby, Pa., there is a high-pressure system in operation on 35 or 40 miles of pipe, including services, in which the gas is brought at high pressure direct to the consumers' meters, individual pressure-regulators being used. Mr. F. H. Shelton, of Philadelphia, has been the leader in adopting this method of distribution; and after three years' experience, he predicts that it will work a revolution in the gas practice of the next generation. Mr. G. F. Goodnow read a paper at the last meeting of the Wisconsin Gas Association, describing the successful use of the system in his city, and stating that, in addition to the saving that it effects in the first cost of the plant, it gives the consumer better service, and more regular pressure, with fewer freeze-offs in cold weather, besides affording a ready opportunity to employ intensified gas lighting for both street and interior illumination.

Low-Pressure Gas Distribution.

Much attention is being paid to the proper and economical distribution of low-pressure gas. In some of the larger cities, a system of so-called "pumping mains" is now running from the works direct to the various points in the distribution system where the gas pressure is at times insufficient. The gas is pumped into this system of mains at a sufficiently high pressure to adequately reinforce and equalize the pressure throughout the city; this reinforcement being automatically controlled by means of balance-governors on the pumping mains, placed in pits in the streets at the points where such mains discharge into the regular distribution system. When the pressure in the distribution mains in any locality rises above the proper height at which the governor at this point is set, the discharge of the high-pressure gas into the distribution system at that point is automatically discontinued, but continues at the other locations in the city if still needed there. In fact, the pressure throughout the entire city is automatically regulated and equalized with an exactness and nicety absolutely impossible by means of pressure regulators at the works alone.

Gas engineers are also making progress in learning how to plan their distribution systems, so as to secure the maximum conductivity per $1 expended for gas-mains. Very large feeders and very small distributing mains are now coming to be recognized as the most economical arrangement. To quote from a paper read by Mr. H. E. Jones in 1901 before the English Institution of Civil Engineers: "The main arteries should be as few in number, and of as large a diameter as possible, in order to get the largest duty from the weight of metal employed, and with the least friction." This same doctrine was forcibly enunciated by Mr. H. L. Doherty a year previously at a meeting of the Ohio Gaslight Association. A large distribution system is now being planned for a western city contemplating 12 and 16 inch feeders, and 2-inch wrought-iron distributing-mains; this arrangement having been determined upon as the most economical.

Thawing Services by Electricity.

This is an application of electricity that has been made within the past five years, having been first introduced at Madison in 1899, and later in other northern cities. A frozen gas-service covered with several feet of frozen ground is a serious matter; but it has been demontrated that, by passing a current of electricity through the pipe, it can be quickly heated to a temperature sufficient to melt the frozen water or moisture within it; and at a cost, with proper equipment, not to exceed $5 or $10, and as low, according to one company's occasional experience, as 80 cents.

Trenching-Machines.

Improvements have recently been made in power machines for excavating trenches for gas-mains; and one concern will this spring circularize the gas companies of this country with reference to their machine for this purpose. The machine, which operates somewhat like a vertical rotary snow plough, can be had of various sizes; and for gas companies in the larger cities, or for contractors who desire to bid on such work for the various gas companies in one neighbourhood, it should reduce the cost of the trench work, except where the soil is rocky.

Prevention of Electrolysis.

Unfortunately but little progress has been made in the prevention of the electrolytic destruction of gas-pipes by the return current of electric street railways operating in their vicinity. Various makeshifts and palliatives have been resorted to—such as insulating joints, paints, glazed tile coverings, tar concrete, &c.; but no substantial cure for the trouble had been extensively adopted, not so much because it is a physical impossibility to do this, as because the Courts have not yet clearly fixed the responsibility for remedying the trouble as between the gas companies and the street railway companies. The trend of Court decisions is, however, to place the obligation for the prevention of the trouble upon the latter. An authority on this subject writes as follows under date of Jan. 21, 1903:

I regret that so little real advance has been made during the past five years in the prevention of electrolysis of gas-pipes. The responsibility of electric railway companies for damage done by their returning currents to the metallic pipes of gas companies and water companies has been a matter of vigorous litigation in State and Federal Courts for a number of years past; but in no case has a decision been arrived at which is final. In certain cases the Courts have held the railway company responsible for damage, but have likewise held that owners of the pipes must co-operate with the railway companies to prevent the damage. This has left the matter as much in the air as ever.

It is commonly recognized that complete immunity of the pipes from injury cannot be successfully secured while the return currents of the railways are permitted to flow through the rails and earth. It is likewise recognized that the damage and danger may be greatly reduced by intelligent installation of the grounded return circuit of the railways and continuous careful supervision thereof. Railway companies have frequently been very seriously negligent in the way in which their return circuit has been installed; and they have been equally negligent in the way in which they have permitted their return circuits to become deteriorated.

I think that the responsibility of the railway companies will be clearly determined by judicial decisions within the next two or three years; and we may then expect improvements to be entered upon which have been entirely neglected in the past. I look forward to the considerable extension of the conduit double-trolley in our large cities, whereby the current is entirely removed from the earth, which will completely remove the possibility of danger from electrolysis in these cities; and I also look forward to the use, to some degree at least, of the double overhead trolley in some of our smaller cities. In other cities, I imagine that the railway companies and the owners of pipes will come to some suitable compromise, in which the railway company will acknowledge its liabilities, and will join the owners to pay the expenses of continuous supervision and repair of the pipes.

Manchester District Institution.—The quarterly meeting of the Institution is fixed for the 23rd inst. at Sheffield. The chief features will be a visit to the Grimesthorpe Gas-Works, by permission of the Directors of the Sheffield United Gaslight Company, and a drive to Baslow, which is only about half-an-hour's walk from Chatsworth.

Sulphate of Ammonia in Germany.—In a recent issue, the "Chemical Trade Journal" commented on the rapid increase in the output of sulphate of ammonia in Germany, and subsequently cited the following cases in support of the statements: The Gelsenkirchen Coal and Coke Company produced 5963 tons last year, against 4726 tons in 1901; the Consolidation, 2431 tons, against 2155 tons; the Nordstern, 2197 tons, against 1950 tons; the Friedrich del Grosse works, 1303 tons, against 1155 tons; and the Bochum Coal and Coke Company, 934 tons, against 886 tons. These five concerns alone account for an increase of 2000 tons, and there are scores of others, every modern blast-furnace and coke-oven in the country being fitted with appliances for the recovery of the valuable bye-product.

RETORT STOKING BY ELECTRICITY.

The Sarrasin System.

One of the latest followers in the footsteps of Mr. John West and Mr. Foulis in the work of lightening the labour of the gas stoker is M. Sarrasin, who has devised and patented in France machinery for charging and drawing retorts, which he described in a recent number of the "Bulletin Technclogique" of the Société des Anciens Élèves des Écoles des Arts et Métiers. It is shown in the accompanying illustrations—figs. 1 and 2 being respectively a vertical and a horizontal section of the charger; figs. 5 and 6, similar diagrams of the drawer; figs. 3 and 7, transverse sections of the charger and drawer; and fig. 4, a section of the hopper. From the detailed description given by the inventor, whose name appears in the programme for the meeting of the Société Technique this week, we take the following particulars.

The charger consists of an iron frame, which is prolonged to afford space for the stoker. The frame is supported by two axles, resting in bearings fixed to it, upon which are keyed grooved wheels running on rails. Two cast-iron uprights A, forming supports and slides, stand on the frame, and are fixed thereto symmetrically. Inside each upright is a screw with a square thread, resting at the lower part in a step-bearing, and at the top secured by a collar. These two screws with threads running in opposite directions are worked by bevel wheels by a horizontal shaft B, which rests on two bearings fixed to the top part of the uprights, and at one end is furnished with an endless chain. Between the uprights there is a cast-iron supporting platform C, which can run along them and be brought to the required altitude by two screws. The platform is extended forwards and backwards by cast-iron brackets and angle-irons to support friction rollers or slides to guide and support the scoop. Wrought-iron supports are fixed on the platform and its brackets; and on these supports there are iron plates D, placed at an angle of 45°, to guide the coal into the scoop. On the front support there is a small scraper which can be raised or lowered to regulate the quantity of coal in the scoop. In the middle of the platform,

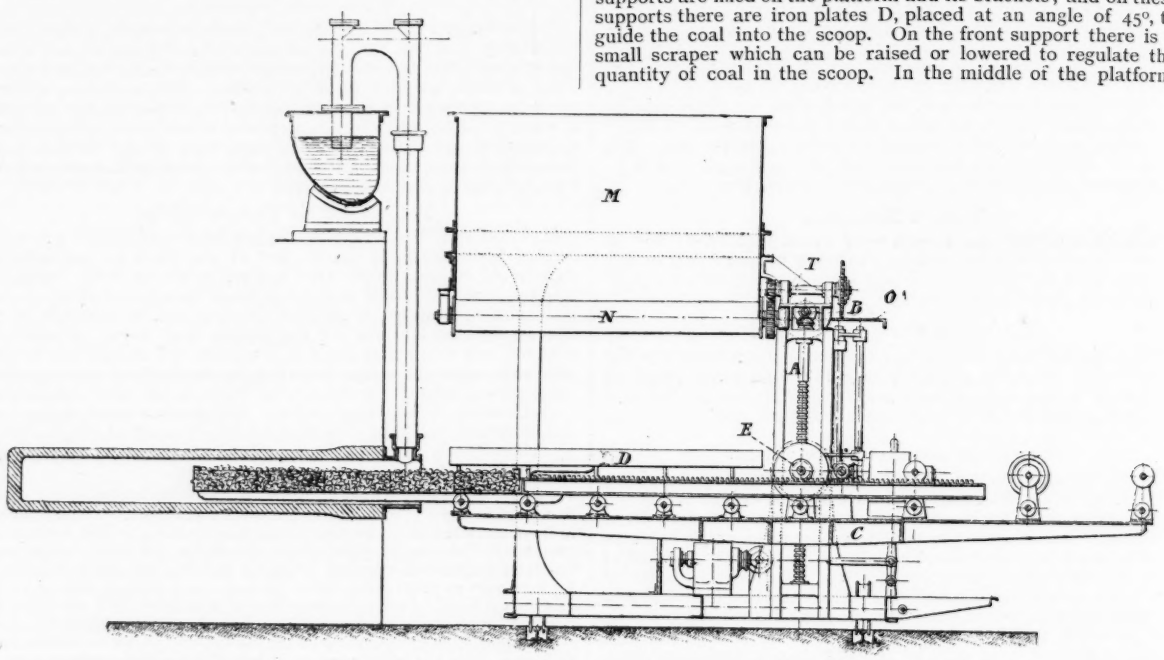


FIG. 1.

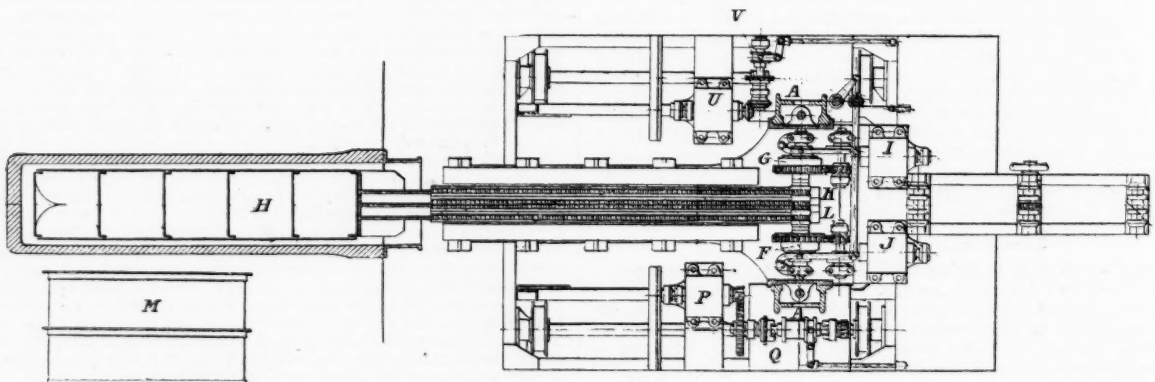


FIG. 2.

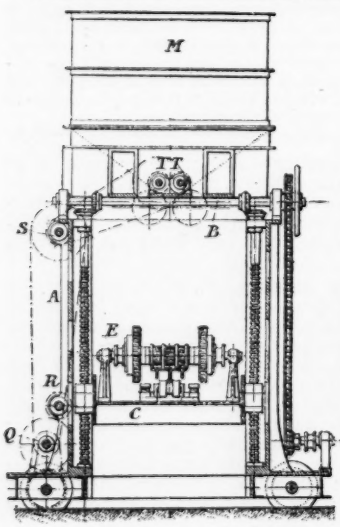


FIG. 3.

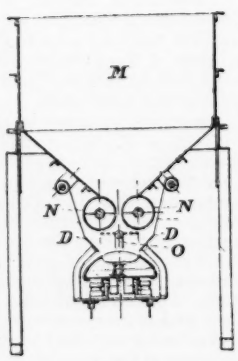


FIG. 4.

within the axis of the upright slides, there is a horizontal shaft E resting on two bearings forming part of the platform. On this shaft there are two toothed wheels, turning in opposite directions, and loose on the shaft, two clutch coupling boxes F and G corresponding to each of the wheels (by the aid of which the shaft E can be made to rotate in one direction or another), and three pinion wheels of similar diameter and pitch to work the charging-racks. The coupling boxes are actuated by a hand lever. The scoop H, the form of which varies according to the section of the retort into which it enters, is capable of holding about 6 cwt. of coal. Its size should be regulated so as to ensure its clearing the carbon which always forms inside the retort. It consists of two parts—the upper one rigid and fixed to the sides, and the lower one hinged to the other, and opening only from front to back. When the sides are drawn out, the lower parts rise of their own accord, coming into contact with the coal, and pass over and leave a sufficient depth for the requisite amount of coal. On leaving the retort they fall automatically, and resume their vertical position. Two small electric motors

I J (fig. 2), each of 1-horse power, are fixed on either side of the charger, in front of the supporting platform. These motors drive two countershafts K L, resting on bearings fixed to the platform. To these shafts are keyed the pinions driving the two loose wheels of the shaft E. A sheet-iron hopper M, to contain from 4 to 5 metric tons of coal, is fed either by small waggons running along an overhead line, or by moving the hopper to one end of the house or a suitable place where there is the requisite appliance to raise the coal. The bottom of the hopper is formed of two grooved rollers N, for breaking the coal to the required size. This can be done by altering the space between them. To prevent the coal falling through when they are at rest, a shutter O (fig. 4) rises or falls automatically, according as the rollers are working or not. A small sliding horizontal lever O^1, moved by hand, allows the length of the rollers to be regulated. Other devices can be adopted to form the bottom of the hopper, which must also act as distributor. An electric motor P, for working the apparatus, is fixed on the frame, and is protected against the heat of the furnaces by a wooden screen. It is of 3-horse power, and drives a countershaft Q, governing a second shaft R, which by an endless chain drives one of the axles. The speed is about 65 feet per minute. The sprocket wheel moves the breaking rollers by means of a second countershaft S, resting on two bearings fixed to the top part of one of the uprights. This countershaft also is driven by an endless chain, and, in turn, works two small shafts T resting on a bearing fixed to the cross-bars of the uprights, and driving, in opposite directions, the two rollers by pinions and spur wheels. The speed of the rollers is rated at about 15 revolutions per minute. An electric motor U, of 3-horse power, moves the platform carrying the scoop.

The action of the apparatus is as follows: Supposing the scoop to be in position to enter the retort, the two motors I J are working. The first revolves in the direction corresponding to the entrance of scoop, and the second the opposite way. In order to fill the scoop, the motor P is started, and the pinion driving the rollers is geared by means of a lever and the double coupling box on the countershaft Q. The shutters O fall, and the coal drops into the scoop. When it contains a sufficient supply, the two rollers are stopped by throwing the pinion out of gear, and the scoop is run into the retort. When all the coal has been deposited, the two lateral racks are moved away by a catch, and return to engage under their driving pinions. The toothing of

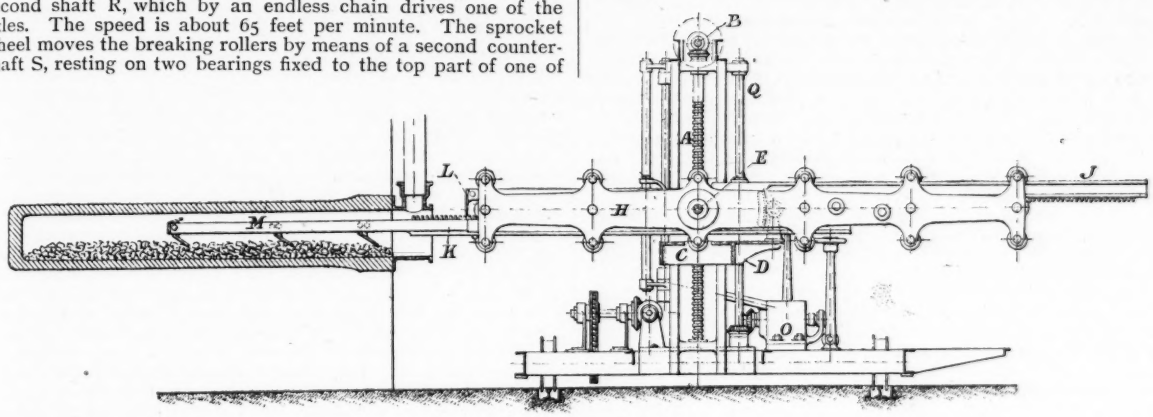


FIG. 5.

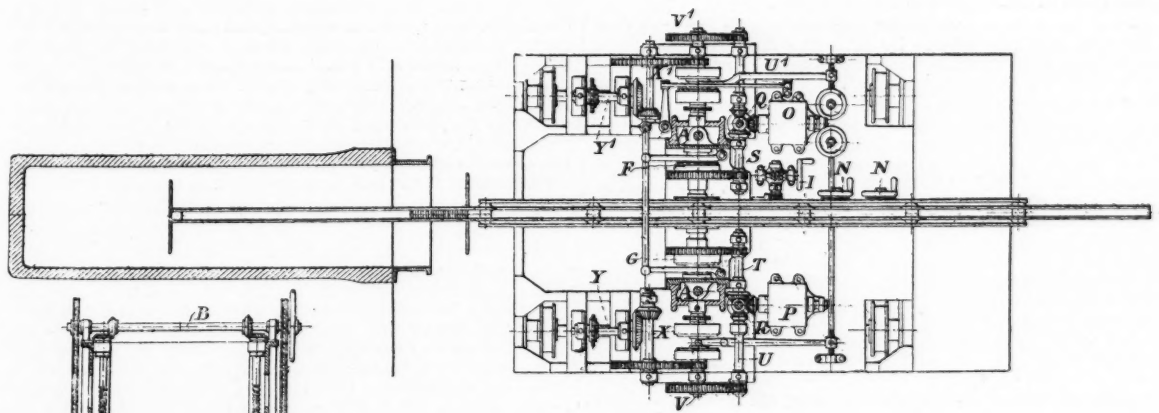


FIG. 6.

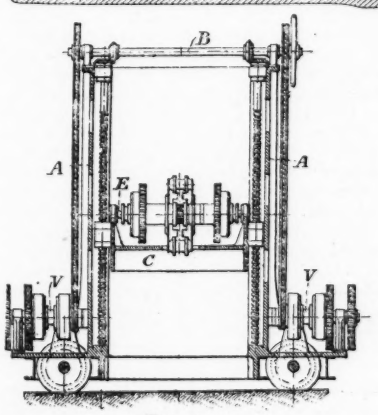


FIG. 7.

the central rack is placed so that it no longer gears with the pinion when the bottom is sufficiently withdrawn. The two lateral racks continue to move, and stop when their teeth are no longer in contact with their pinions in the same way as the central rack. Thus the distance traversed is perfectly regulated, and is absolutely reliable. The scoop is now ready for refilling. When this has been done, the apparatus is moved so as to exactly correspond with the retort to be charged. When opposite the retort, the scoop must be raised or lowered to the proper level. In order to attain the exact height, the stoker has within reach a hand-wheel keyed on the end of the horizontal shaft B, by the aid of which he can fix the altitude of the platform. When a layer of coal of variable thickness is required, the scoop must not be filled along all its length.

It takes at the utmost 8 seconds to fill the scoop; the insertion of the scoop and the withdrawal of the bottom and sides, a maximum of 10 seconds; the passage of the apparatus from one retort to another, 3 seconds; the vertical motion of the platform for a height corresponding to the distance of the two bottoms of two retorts placed one above the other, 4 seconds—making a total of 25 seconds. For getting the scoop into position to enter the retorts, 20 seconds must be allowed. It requires, therefore, an average of 45 seconds for all the operations of charging a retort. Thus 80 retorts can be filled per hour. The necessary distance from the face of the furnaces to the wall should be some 20 feet, supposing the retorts to be 10 feet long.

We now come to the drawing-machine. It consists of an iron frame, prolonged by a platform for the stoker and the gear for starting the motor. This frame is supported by two axles, which rest in bearings fixed securely to it, and grooved wheels running on rails are keyed upon them. Two cast-iron uprights A rest on the frame. Inside each of them there is a screw with square thread, resting at the lower part in a step bearing, and at top in a collar bearing. These two screws, with contrary threads, are worked by bevel wheels and a horizontal shaft B. There is a supporting cast-iron platform C, between the uprights, which slides on them, so as to be brought to the proper height by means of the screws. In front of the platform are two small brackets D, to support the parts requisite to fix or swing the balance-beam carrying the rakes. In the middle of the platform, and in the axis of the uprights, is a horizontal shaft E, on which there are two cog-wheels turning, in opposite directions, two friction coupling

boxes F G, corresponding to each wheel, by means of which the shaft E can be turned in one direction or another. A balance-beam H on this shaft is formed of two sheet-iron plates cut in the requisite form. The swinging motion is obtained by the aid of the endless screw I, fixed on the brackets D of the platform. The balance-beam has two racks J K, with their rakes L M. Thus there is a second rake available when one is too hot, or a rake with a small scraper to begin the operation of emptying, when large quantities of coal have to be placed in the retorts and the coke fills them too much, and the other with a larger scraper to finish with. As the two racks are governed by the same pinion, it is possible to disengage the rack from the pinion not required for work. For this two hand-wheels N are employed, by means of which the racks are moved forwards or backwards separately, each rack having a special pinion. Two small electric motors O P, of about 1-horse power, are placed on the frame. They impart all the necessary movements to the machine, and drive, by bevel wheels, two vertical shafts Q R. There is a bevel pinion on each of these shafts, which can slide on them, and is caught by a collar fixed to each side of the platform, so as to follow it in its vertical movement. The pinions drive two countershafts, S T, working the loose wheels on the shaft E.

Movement of the machine to the right or of the platform upwards is obtained by means of the countershaft U. It is driven by the bevel wheel keyed to the lower part of the vertical shaft R, and has on the other end a spur pinion driving-shaft V, which governs a second countershaft X. This, by bevel wheels, drives the shaft Y, on which is keyed a pinion transmitting motion to the axle by means of a sprocket chain. The wheel for this chain on the shaft V serves to raise the platform. It transmits motion to the shaft B. Movement of the machine to the left, as also the descent of the platform, is obtained by similar appliances to those employed for the reverse movements. The starting gear for the electric motors is all on the frame of the machine within easy reach of the stoker.

The drawer works as follows: Supposing the machine to be in proper position, and pointed so that one of the rakes can be run into the retort (the other rake being withdrawn so that its teeth have left the pinion), the two electric motors O P are turning in opposite directions. By the aid of a lever, the friction coupling box F is worked, and if the motion of the motor O corresponds with the advance of the rack, the horizontal shaft E will turn, and the pinion keyed in its centre will draw the rack along for running the rake into the retort. When the rack can move no farther, the balance-beam is made to swing a little, so that the scraper of the rake falls vertically, and assumes its true position on the bottom of the retort. By reversing the mechanism, the shaft E turns in an opposite direction to the first, draws the rack, and the rake comes out with the coke. The maximum time required for drawing a retort does not exceed 40 seconds; so that from 80 to 90 retorts can be drawn per hour.

When the two machines work together uninterruptedly, 80 retorts can be charged and drawn per hour. If, to give the stokers occasional rest, the machines work 18 hours per day, the number of retorts dealt with per hour will be 60, which represents the carbonization of 259 metric tons of coal in 24 hours at the rate of 180 kilogrammes (about 3½ cwt.) per charge, and a production of 72,500 cubic metres, or 2½ million cubic feet, of gas. For such a make, to say nothing of the handling of coal and coke, which it may be supposed is done by machinery or otherwise, there must be 52 stokers to charge and draw by hand—26 for day and 26 for night work—reckoning two stokers for three beds of nine retorts. With the electric machine, four enginemen are needed—two by day and two by night—and four men to open and close the lids of the retorts and clear the ascension-pipes. There is consequently a difference of 44 men. Reckoning the daily wages of a stoker at 6 frs., the saving is 264 frs. per day, or 96,000 frs. per annum. From this amount, the cost of the electricity, &c.—viz., 6000 frs.—must be deducted. But the balance is much larger than the sum needed to construct the plant. Besides the economy effected (varying, of course, with the size of the works), the inventor claims the advantage of better carbonization, due to the retorts being more uniformly and rapidly charged, resulting in a much higher yield of gas.

VALUATION OF GAS COALS.

We have received from the Secretary of the North of England Institute of Mining and Mechanical Engineers (Mr. M. Walton Brown) a print of a paper on the above subject read by Mr. James Stewart, at a meeting of the Institute held towards the close of last year. The following is an abstract of the paper.

The author began by pointing out that the valuation of coal for gas-making purposes is peculiar in this respect—that no ordinary laboratory method of analysis, such as serves for most technical materials, will suffice. The actual value of gas coal can only be ascertained by imitating the treatment it will receive in the works, so as to produce from it both the gas and the bye-products. The ordinary laboratory apparatus carbonizes at one operation 2¼ lbs. of coal; but the experimental plant of a modern gas-works is generally on a much larger scale, being arranged to carbonize quantities ranging from 1 cwt. up to 4 cwt. of coal, or even more, at once. In skilled hands, the small laboratory apparatus furnishes very trustworthy results; but it has the drawback of almost invariably attributing to the coal a higher value than is borne out on the working scale. This failing is likely to be more accentuated in the hands of an inexperienced operator, for reasons which the author explained in a review of some of the particulars wherein the apparatus necessarily differs from the actual plant employed in gas-works. In the first place, the retort is of iron, which is a better conductor of heat than clay, and can always be ascertained to be sound before making a test. Next, the temperature is under complete control; and the coal will usually be perfectly dry before it is put into the retort. Further, the resulting gas is subject to different treatment in the matter of condensing, washing, and scrubbing. A slight increase in the percentage of hydrocarbons, due to inefficient condensation, might make a considerable difference when the gas came to be tested photometrically. If such a result was obtained with every desire to be fair, what, asked the author, might not be done when the gas was purposely "coddled" with a view to high results. However carefully and conscientiously a test may have been carried out, it is hopeless to attempt to predicate from the result the corresponding result that will be obtained in the gas-works. It must obviously depend upon the skill and intelligence brought to bear upon the working, as well as on the degree of perfection of the plant employed. While, therefore, it will be the aim of the analyst to arrive at the ultimate value of the coal, he must ever keep in view the actual conditions of gas making, and not take advantage of favouring circumstances to obtain results which cannot, even when exercising great care and skill, be realized in practice.

The author went on to refer to one other matter requiring to be taken into consideration in interpreting the results of a coal test—viz., the question of the burner with which the illuminating power of the gas is determined, including the manner in which it is used. Obviously the burner used should, he said, be the standard one for the particular quality of gas—that is to say, the "London" argand for qualities up to 18-candle power, and the batswing for qualities of 19-candle power and upwards. But it is neither necessary nor desirable that it should always be used under standard conditions. Under the absurd regulations which, everywhere but in London, govern the testing of coal gas, the illuminating power has to be determined with a fixed consumption of exactly 5 cubic feet per hour. When burning different qualities of gas in the argand burner, a uniform consumption must be prejudicial to the lower qualities, because more air is drawn upon the flame than is required, thus cooling and over-oxidizing it, with the result of depreciating the illuminating power. The analyst should therefore vary the consumption to suit the quality of the gas, and calculate the result to the 5 cubic feet rate. But, if this be done, it is very important that the fact should be stated in the report, so that the gas manager may know that he has to expect a less satisfactory result when the gas is consumed at the standard rate.

On the subject of the paper, Mr. W. Doig Gibb, Engineer of the Newcastle-upon-Tyne and Gateshead Gas Company, wrote that its teaching was that what was known as a "laboratory test" would not give results comparable to those which could be obtained in actual working. This, he said, had been known for a long time. In larger gas-works, where the capital expenditure required could be afforded, there was no doubt that an experimental plant on a working scale was of much greater advantage to gas engineers generally than a laboratory plant could be. But even then it was still a benefit to have such a plant in addition, since, with the latter, tests could be taken quickly and without great cost; and though the results might not be comparable to the actual working results, they were trustworthy (if proper care were taken in testing) in comparing the different results obtained from the various coals tested. Mr. Stewart did not seem to believe in the future possibility of the tests on a laboratory plant being made in such a manner as would approximate the results obtained on a working scale. It might not be possible, but it would be a step in the right direction if standard laboratory apparatus, and standard methods of using it, were adopted. This would, at all events, result in the different published analyses of coal being comparable with each other. At present, owing to the various methods employed in sampling and testing, and also to the absence of any information on the printed analyses sheets as to the methods, &c., employed, an interested reader had great difficulty in comparing, in any accurate way, the value of one with another.

A vote of thanks was accorded to Mr. Stewart for his paper.

North British Association of Gas Managers.—The Committee of the Association are making preparations for the annual meeting, which will be held at Ayr on the 30th and 31st of July; and, in accordance with the usual practice, the Secretary (Mr. R. S. Carlow) has issued a preliminary circular inviting the co-operation of the members in keeping up the interest of the gathering by contributing to the technical proceedings. In the event of their being at a loss for a subject, a good list is given, embracing all branches of gas manufacture and distribution, from which to select one.

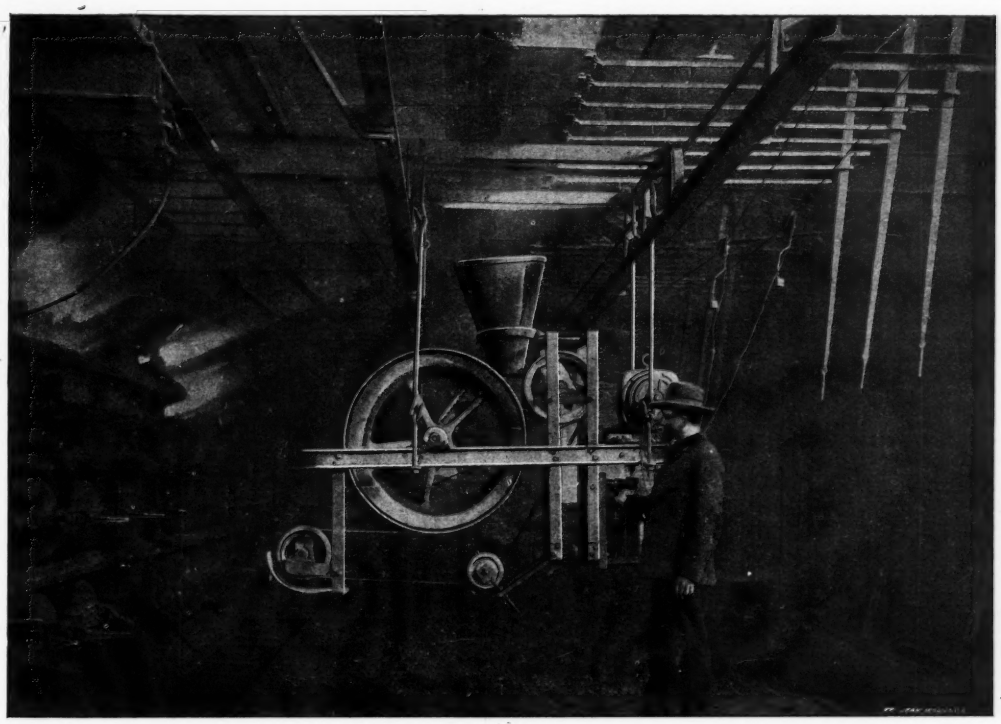
THE DE BROUWER RETORT-CHARGING MACHINE.

The description of the new retort-charging machine invented by M. de Brouwer, of Bruges, which was given in the "JOURNAL" for the 24th of March (p. 748), lacks little in point of completeness until further developments have taken place. Nevertheless, the remarks of Heer P. Bolsius, the Manager of the Bois-le-Duc Gas-Works, embodied in an interesting article published by "Het Gas," form a fitting supplement to the "JOURNAL" article; and we therefore reproduce the substance of them. Our Dutch contemporary gave the two views of the charging-machine which appeared on pp. 748-49 of the "JOURNAL;" but through the kindness of Heer Bolsius, we are now able to give a hitherto unpublished reproduction of a photograph of the machine as it was made at the close of M. De Brouwer's successful experiments.

One of the most arduous operations which are carried out on gas-works is the charging of retorts by means of the shovel or scoop. Shovel-charging demands not merely great bodily strength, but practical skill—as when, as is usually the case, two stokers work together, one shovelling from the right, and the other from the left. The high temperature which prevails in front of the bench of retorts, and the rapidity with which the charging has to be carried through, are mainly responsible for the arduous nature of retort-charging with the shovel. Scoop-charging is in many respects an advance. It, however, requires three men working in conjunction; and the work is harder, and performed under even more unfavourable conditions than that of shovel-charging. For works of small size, where fewer than three stokers are employed together, arrangements were devised which enabled one man to manipulate the charging scoop; and the heavy shovel work was thus entirely dispensed with.

But this was not the end of the matter. It was noticed that in factories and workshops of all kinds, workmen were relieved of excessive bodily exertion by the introduction of machines—driven by steam, gas, or electricity—to perform the roughest and most unhealthy tasks. These machines were, however, introduced only with difficulty; for though they were adopted in some large works, they did not appear suitable for more general application. The chief faults of the charging machines were their clumsiness and their complicated arrangements. They were costly, both to purchase and to work and maintain; so that they only proved economical where rates of pay for stokers were exceptionally high. Other methods, therefore, were sought; and there was a reversion to former practice in the direction of partially utilizing manual labour. The work was shared by man and machine; and the best results were achieved in this manner.

Stoking machinery, as hitherto made, has introduced the coal into the retort by means of a charging-scoop, the form of which has been varied in the different types of machines. The method of charging, however, has remained essentially identical with all. The charging machine introduced by M. de Brouwer acts on quite a different principle—it throws the coal into the retort, after the manner of shovel-charging, but with greater rapidity



and regularity. It thus constitutes an entirely new departure. Its construction embodied a very difficult task, the solution of which has been accomplished in a strikingly simple manner. The charging machine in this respect recalls the simplicity of the de Brouwer conveyor. The illustrations and description already given in the "JOURNAL" will have made its mode of operating clear; but a few observations may be offered on the design, which is deserving of close study. The machine aims at throwing into the retort lumps of coal having a maximum size of 4 to 5 inches. A short conveying band, driven forwards at high speed over three small rollers, is pressed on its outer surface by a large wheel which compels it to follow its curvature through nearly one-fourth of its periphery. An electro-motor attached to the machine drives the wheels. The large wheel has a deeply grooved rim, with which the conveying band forms a covered channel. A funnel or hopper, placed between the large wheel and one of the smaller ones, discharges coal from an overhead receptacle on to the conveying band. The coal follows the wheel in its revolution, and is forced outwardly against the conveying band. By the time the latter leaves the wheel, the vertical direction has become nearly horizontal. The coal follows the course of the band until the band turns downwards to pass round one of the small wheels; whereupon the coal flies off the band in the horizontal direction, and with the velocity communicated to it. By setting the apparatus at the proper height in front of an open-mouthed retort, and properly regulating the velocity, the charge of coal may be introduced into the retort by simply allowing the coal to fall from the funnel on to the conveying band. The coal traverses the channel in the rim of the large wheel, and is flung into the retort, where it forms an even layer of suitable breadth and depth. The coal is at first flung to the farther end of the retort, and the layer on the bottom of the latter is built up as uniformly as possible, until it reaches the mouth of the retort. The charge is transferred to the retort with astonishing speed, as Heer Bolsius has determined by actual timing. One retort was charged in 13 seconds; the machine was then moved and brought in position in front ot the next retort in 7 seconds. Thus three retorts in the same horizontal tier can be charged by one machine within a minute. One man manipulates everything, and the work is simplicity itself; so that an ordinary stoker may at once take charge of the machine.

The machine travels along the face of the bench of retorts in the manner shown in the illustration, and it may be readily raised or lowered by means of tackle. For 7-foot long retorts, the large wheel makes 200 revolutions per minute, and imparts a velocity of 2050 to 2130 feet per minute to the coal.

The advantages associated with this construction are so obvious that Heer Bolsius thinks the de Brouwer charging machine is bound to make way at once. Experienced gas engineers have been very much impressed and astonished at the results it achieves. The layer of coal is deposited in the retort so quickly and evenly, under easy control, that the first products of the distillation of the coal do not have time to develop before the lid of the retort is closed. The apparatus offers a means of abolishing the heavy work of manual charging even in gas-works of moderate size; and in this manner it constitutes an important advance.

HEAT REACTIONS OF GASEOUS MIXTURES.

The current number of the "Journal of the Society of Chemical Industry" contains the text of an important paper by Mr. R. FORBES CARPENTER, the Chief Inspector under the Alkali Works Regulation Acts and Mr. S. E. LINDER, B.Sc., his Assistant, entitled "Studies on the Claus Reaction," presented to the Liverpool Section of the Society. It is divided into two parts, in the first of which the authors deal with the heat reactions, theoretically considered, of different gaseous mixtures; while in the second they give the results of some experiments with manganese oxides as contact material in place of ferric oxide. We reproduce the first part of the contribution.

Since the year 1893, when Mr. J. W. Kynaston read a paper before this Section on the waste gases of the Chance-Claus sulphur-recovery process, with suggestions as to their treatment for utilizing their sulphur contents, the "Journal" of our Society has contained no further references to the chemistry or physics of the Claus reaction until last year, when, also before this Section, Dr. Conroy devoted some consideration to the Claus sulphur recovery process in his review of catalysis and its applications to manufacturing operations.

The first application of the patents of the late Mr. C. F. Claus was in connection with desulphurizing gas liquors for use in the removal of sulphur impurities from crude illuminating gas. The process differed from the earlier attempts of Laming, Hills, and Sir George Livesey, in adding ammonia gas to the crude coal gas in place of scrubbing the latter by caustic ammonia liquor. The preparation of both caustic ammonia gas or liquor involved the desulphurization of large volumes of resultant gas liquor by heat with evolution of sulphuretted hydrogen and carbon dioxide. Mr. Claus set himself to solve in a practical way the problem of the recovery of sulphur from these gases. In Mr. A. M. Chance's paper, read before the London Section of the Society in March, 1888, the various patents of 1882 and 1883, taken out by Mr. Claus, are rehearsed. The process thenceforward received a much larger extension in its application to the recovery of sulphur from the sulphuretted hydrogen produced in Chance's own process.

It is essential, however, to note that the principal gas accompanying the sulphuretted hydrogen in the desulphurization of gas liquors is carbon dioxide, while in the Chance process this is replaced by nitrogen. This difference has considerable effect on the heat reaction in the Claus kiln, seeing that the specific heat of carbon dioxide rises so very much more than that of nitrogen at high temperatures; and as in many gas-works the proportion that the sulphuretted hydrogen bears to the carbon dioxide removed from the crude gas by the scrubbing operations is extremely low, a point is not unfrequently reached when the gases are too weak in sulphuretted hydrogen for the heat reaction in the Claus kiln to develop sufficiently high a temperature for successful decomposition. It has for years been recognized that if the percentage of sulphuretted hydrogen falls below 15, the remainder being carbon dioxide, stoppages of the process are liable to occur, by masses of sulphur solidifying in the base of the kiln in place of a steady flow of liquid sulphur being maintained to the first bay of the "flowers" chamber.

TABLE I.

—	Reacting Mixture.						Temperature of Reaction—°F.		
		Composition per 100 Volumes.					Calculated.		Found.
							100 Parts of Sulphur as Sulphuretted Hydrogen, oxidized to		
	Temperature.	CO_2.	H_2S.	O.	N.	Aqueous Vapour.	100 Free S.	50 Free S, 50 S as SO_2.	
A.—Hypothetical Mixtures.	°F.								
1.—Dry gas contains 20 per cent. H_2S, 80 per cent. N.	90	Absent	9·53	9·53	76·27	4·67	(*b*) 960	(*b*) 1,750	..
2.—Dry gas contains 6·67 per cent. H_2S, 93·33 per cent. N.	90	Absent	4·77	4·77	85·79	4·67	(*a*) 680 (*b*) 550	(*b*) 1,010	..
3.—Dry gas contains 2·86 per cent. H_2S, 97·14 per cent. N.	90	Absent	2·38	2·38	90·57	4·67	(*a*) 400 (*b*) 330	(*b*) 570	..
4.—Dry gas contains 20 per cent. H_2S, 80 per cent. CO_2	90	38·13	9·53	9·53	38·14	4·67	(*b*) 775	(*b*) 1,350	..
5.—Dry gas contains 6·67 per cent. H_2S, 93·33 per cent. CO_2	60	68·83	4·92	4·92	19·66	1·67	(*a*) 515 (*b*) 425	(*b*) 725	..
B.—Jacketed Claus Kiln at Granton.								22 per cent. S as H_2S. 17 per cent. S as SO_2.	
6.—Moist gas contains 7·6 per cent. H_2S, 83·4 per cent. CO_2, 9·0 per cent. air	60	56·20	5·10	7·40	29·70	1·60	(*a*) 545 (*b*) 450	(*a*) 555 (*b*) 495	570

(*a*) Sulphur assumed to be in liquid state. (*b*) Sulphur assumed to be in state of vapour.

Students under the Alkali Acts may remember the experimental work on a small Claus kiln constructed to observe reactions conducted on laboratory scale, the results of which are described in the report for 1899. From the conclusions at which we arrived, Dr. Conroy quoted the chief and most important in his paper above mentioned. The gases then experimented with contained 8 to 12 per cent. of sulphuretted hydrogen; the remainder being carbon dioxide. In the report for 1901 are given the results of tests obtained from the working of a large plant, where the gases treated contained from 7 to 8 per cent. only of sulphuretted hydrogen, the balance being carbon dioxide, and where the heat requisite to maintain the decomposition of the sulphuretted hydrogen was supplied by waste fuel gases (from steam-boilers) which circulated around the annular-shaped kiln on their passage to the chimney.* Loss of heat by radiation was thereby prevented. Experiments showed that the temperature of the contact material in the kiln, within the limits of efficient reaction, is determined by the energy of chemical reaction, rather than by the temperature of the furnace gases circulating in the surrounding jacket.

Mr. W. R. Herring, the Engineer and Manager of the Edinburgh and Leith Gas Commissioners, has kindly given permission for the communication of the details of plant and results that appear in this paper. The dimensions of the kiln at the Granton works are as follows: (1) Cross section, an annulus; large diameter, 17 feet; smaller, 5 feet (inside measurements). Superficies of this, 207 square feet. (2) Height of kiln, 7 feet; of the packing, to whose composition we will refer later, 2 ft. 6 in.

* See "JOURNAL," Vol. LXXX., p. 498.

Heat Reactions, Theoretically Considered, of Different Gaseous Mixtures.—It appeared of interest, in view of the conclusions as to heat supply previously mentioned, to ascertain by calculation what would be the maximum temperature attainable from the reactions in the kiln by the passage of a mixture of gases of known composition, and these are set out in the accompanying table.

The data necessary for the thermo-chemical calculations involved were collected from various sources. We have thought it well to specify the authorities, as there are some notable divergencies in the values given by various experimenters. The greatest differences in specific heats at high temperature occur in the cases of carbon dioxide and water vapour, two of the products most frequently occurring in processes where thermo-chemical calculations are applied as an aid in following the course of reactions.

In the hypothetical gaseous mixtures tabulated, twice the volume of air required for perfect decomposition was supposed to be present. The calculations of thermo-chemical reactions were extended beyond the stage of complete decomposition to combination of the residual oxygen with half the sulphur produced. The column "50 Free S, 50 S as SO_2" shows the rise of temperature resulting from this second stage of reaction.

In gas-works practice, as shown by example 6, it is not unfrequently found that there is a considerable excess of air present over that demanded by the equation $H_2S + O = H_2O + S$. With dilute gas it does not at all follow that the whole of this excess appears later as sulphur dioxide; doubtless, at high temperatures with gases of 20 per cent. sulphuretted hydrogen and upwards, the remainder being nitrogen, this would be the case; for with

the Chance-Claus gases tested on leaving the kiln or the flowers chambers it is usual to obtain a negative test for the presence of oxygen. With the gases of the composition of Examples 2, 3, and 5, it is proved by the Granton experiments that both sulphur dioxide and oxygen pass away together from the kiln. It appears probable that if the sulphur is in the liquid state, and not in that of vapour, the heat in the kiln being comparatively low and much below the boiling-point of sulphur, the opportunities for combination are lessened.

The temperatures given are calculated to Fahrenheit scale, as that in use in ordinary works. The two hypothetical mixtures taken with 20 per cent. of sulphuretted hydrogen, varying the diluent remainder (1) as nitrogen, (2) as carbon dioxide, are shown in Examples 1 and 4 of the table. The first might be described as a weak Chance-Claus kiln gas, apart from small percentages of carbon monoxide, carbon dioxide, and oxygen; the second is a gas of the composition frequently met with in Claus kiln plants attached to gas-works manufacturing sulphate of ammonia. The effect of carbon dioxide in lowering one resultant temperature is extremely marked. This is also noticeable in comparing Examples 2 and 5.

Example 3 is calculated to show the limit of application of the Claus process. The percentage of sulphuretted hydrogen being only 2·86, the resultant maximum temperature approaches that regarded from the experiments as the critical temperature, 400° Fahr. A kiln would need to be very carefully constructed, with adequate heat-jacket, to maintain the heat of reaction in the contact zone sufficiently high to prevent solidification of sulphur before the flowers chamber was reached.

Example 6 is calculated from one of the experiments recorded in the report for 1901, where, in the gases leaving the sulphur chamber, 1 cubic foot of permanent gases measured in the aspirator was accompanied by 7·2 grains of sulphur as sulphuretted hydrogen and 5·6 grains as sulphurous acid, giving a loss of 39 per cent. of sulphur. The temperature calculated for this example (*a*) agrees very well with that observed from the higher reading of one or two thermometers in a tube placed well down in the contact mass.*

It will also be noted that a large amount of heat is used up in vaporizing the sulphur resulting from the decomposition. The latent heat of vaporization of sulphur at 316° C. (601° Fahr.) has been ascertained to be 362 calories; and this is the figure used as a basis for the calculations in this table, and in the one that follows. In Examples 2, 3, and 5, both values are given—of sulphur in the state of liquid and of vapour, as, in the case of such a large volume of accompanying permanent gases, sulphur vapour might well be carried in considerable amount at a lower temperature than that named above. At the same time we have given above our reasons for the probability that, in such cases, the sulphur is largely in the liquid form.

It may be stated that the aim of the management at Granton, in installing this plant, was less for sulphur recovery than the decomposition of sulphuretted hydrogen; the sulphur dioxide produced being removed by the passage of the gases through a limestone tower flushed with water, especially designed with this view, and of larger dimensions than is usual in gas-works Claus plants. Hitherto at this works considerable difficulty has been experienced in making the sulphur produced settle in the right place. It persists in following the gases, not settling to any material extent in the flowers chamber, but passing on to the limestone tower, where it forms a closely adhering coat on the rough limestone, almost as if it had assumed the viscous condition. Certainly, to the eye, without the aid of a magnifying glass, the crystalline structure cannot be detected. This obstinate adherence to the limestone materially interferes with the efficiency of the tower in removing sulphur dioxide from the gases, and is clearly one to be met by interposing some apparatus for making this finely divided sulphur carried with the stream of gases aggregate and drop before the limestone tower is reached.

In Table II. are set out, from examples in actual practice, the maximum temperatures in Claus kilns dealing with gases from the Chance process for treating alkali waste for sulphur recovery. In works A the inert gases, during the sulphydrating stage of the process in the Chance carbonators are drawn off, and do not pass to the gasholder supplying the Claus kiln. In B and C they do so pass. Considerable attention is given in this process to

TABLE II.

Works.	Holder Gas per 100 Volumes.					Reacting Mixture per 100 Volumes Moist, 60° Fahr.						Exit Gases, Sulphur.			Temperature of Reaction Calculated.	
	H_2S.	CO_2.	CO.	O.	N.	H_2S.	CO_2	CO.	O.	N.	Aqueous Vapour.	Grains per Cubic Foot of Permanent Gases, 60° Fahr.		Per Cent. of Total Sulphur entering Kiln as H_2S.		
												As H_2S.	As SO_2.			
															° C.	° F.
A	35·0	2·5	1 5	0·5	60·5	18·2	1·3	0·8	9·5	68·5	1·7	11	6	11·5	905	1,660
B (1) . . .	30·0	0·8	1·5	0·8	66·9	16·2	0·4	0·8	9·3	71·6	1·7	8	10	13·5	900	1,650
B (2) . . .	30·0	0·8	Absent	0·8	68·4	16·5	0·4	Absent.	9·1	72·3	1·7	8	10	13·5	855	1,570
C	22·0	2·0	0·5	2·5	73·0	14·4	1·3	0·3	8·3	74·0	1·7	5	9	12·5	805	1,480

keeping down the percentage of carbon monoxide in the gases of the lime-kilns supplying carbonic acid for the decomposition of the waste in the carbonators, and this, on account of the rise of temperature in the Claus kilns produced by the combustion of the monoxide to dioxide, oxidation of carbon monoxide to carbon dioxide being accompanied by evolution of heat amounting to 67,960 calories.

Example C does not illustrate so well as others the influence on temperature of the presence of carbon monoxide in quantity. This, however, is illustrated in B, where (2) represent a condition occasionally obtaining, while (1) represents the usual analysis of holder gases. In A the effect is more apparent, the calories evolved by oxidation of 0·95 gramme of carbon monoxide to carbon dioxide being 2310, against 2250 proceeding from oxidation of 1 gramme of free sulphur to sulphur dioxide; these being the quantities per 100 litres of moist gases reacting (60° Fahr.).

Attention may now be directed to the question of the influence of temperature on the loss of sulphur proceeding either (*a*) from non-decomposition of sulphuretted hydrogen, and from oxidation of some of the sulphur produced by the air present, or (*b*) by the counter-reaction, $2H_2O + 3S = 2H_2S + SO_2$. In many works the aim of the management is to keep the sulphur escaping as sulphuretted hydrogen decidedly in excess of that escaping as sulphur dioxide. Mr. Kynaston, in 1893, in the paper already quoted, stated that the yield of sulphur is undoubtedly greater when sulphuretted hydrogen predominates to the extent of 9 grains of sulphur in this form to 7 grains as sulphur dioxide per cubic foot of permanent gases escaping.

It is difficult, when there are so many varying factors, to trace the influence of temperature on the percentage loss of sulphur, nor can the results set out above be said to give any clear indication. In Example A, with the gas richest in sulphur contents, the maximum temperature attainable is at its highest, while the percentage sulphur loss is the lowest of the three, which, indeed, all closely approximate. There would be required, in addition, comparison of the volumes passing per square foot superfices, or per cubic foot of contact material in the kiln, in a given time, assuming radiation was a constant. We are only able to supply this figure approximately in Example C, where the rate was 0·27 cubic foot of holder gases, corresponding to 0·41 cubic foot of mixed reacting gases (60° Fahr.) in the kiln per square foot of superfices per minute. This rate is lower than that of the gases in the Granton kiln (0·54). Moreover, in deducing any inferences as to the influence of temperature in the promotion of the counter-reaction between the water vapour and sulphur, these should proceed from actual measurement in the kiln itself that is experimented on. The tables can only, as regards temperature, indicate the maxima attainable, not working temperatures varying with the conditions in each work.

We are not able to present any figures of sulphur loss corresponding to those in Table II. for ordinary gas-works Claus plants (composition of gases, 20 to 25 per cent. sulphuretted hydrogen to 80-75 per cent. carbon dioxide); but such figures as are contained in the Alkali Acts reports from 1884 onwards indicate that the losses are lower, especially in sulphur as sulphur dioxide. Probably the counter-reaction between water vapour and sulphur is much less active at the lower temperatures induced by the presence of so much carbon dioxide.

With sulphuretted hydrogen, 100 per cent., the theoretical maximum temperature rises to 1150° C. (2100° Fahr.). Here the influence of water vapour, at the high specific heat attributed to it at the above temperature, is quite as great as that of the nitrogen present in absorbing the heat evolved in the reaction; the equation reading—

$$(t - 16)\ [\underset{\text{Nitrogen.}}{18{\cdot}85} + \underset{\text{Water Vapour.}}{19{\cdot}07} + \underset{\text{Sulphur.}}{3{\cdot}04}] = 46{,}384.$$

Appended to the paper are a number of examples illustrating the way in which the data in the table are applied.

* As the reading of the second thermometer situated on the other side of the kiln showed only 280° Fahr., there is strong reason to believe the reaction in the hotter zone was much more perfect than the average figure would appear to indicate.

RENDERING GASHOLDER TANKS WATER-TIGHT.

In a paper, on "The Effect of Design on Methods of Construction," recently read before the Junior Institution of Engineers by Mr. R. W. Newman, Assoc.M.Inst.C.E., the Vice-Chairman, he illustrated several methods of making a gasholder tank tight. He pointed out that generally the wall would be rendered on its internal face, so as to retain water; but he showed a case in which puddled clay had been put behind the wall, which would, he said, in a great degree, give the desired result, and no difficulty should be experienced in applying the rendering. He also showed a sump sunk independently of the main excavation, and a series of agricultural pipes laid round the tank, to carry off the subsoil water as readily as possible to the sump, from which it was removed by temporary pumping plant. He remarked that, supposing for a moment that the pump was not in use, the water would rise in the subsoil, and find its way through the brick or concrete wall—not in large quantities, but sufficiently to keep the face of the wall damp. Try as one might, the cement rendering would not adhere; but keep the water down, and it would do so without any difficulty. Having once set, the pump might be stopped, and the tank would be watertight. As an additional precaution, it might, he said, be well to fill the tank at the same time, to balance the pressure within and without, and thus not put any undue strain on the rendering until the work had had some time to set properly. A less expensive method of dealing with the water was putting a series of iron pipes through the wall at various points, to let the water at the back of the wall have a free vent. The water was then pumped up from a sump inside the tank, and after the rendering was completed, the cocks on the pipes might be closed, or be so constructed that they could be unscrewed and plugs inserted, the rendering being afterwards made good at these places.

OHIO GASLIGHT ASSOCIATION.

Annual Meeting at Cincinnati.

The Nineteenth Annual Meeting was held on March 18, 19, and 20. Mr. C. W. Andrews, of Hamilton, Ohio, occupied the chair, and the Association was welcomed by the Hon. Julius Fleischman, the Mayor of the city.

Inaugural Address.

The President, in his address, referred to the unparalleled expansion in the output of gas during the past year. He strongly recommended the placing of high-power lamps on favourable terms, and the maintenance of the same by gas companies. As it was known that gas at 4s. or 5s. per 1000 cubic feet was cheaper than any other fuel for cooking, and as most undertakings could supply at such terms, there was no longer any reason for differential prices so far as cooking was concerned. Domestic heating at present afforded a promising field for new business. The natural gas companies were gradually raising their prices; 2s. per 1000 cubic feet being a common figure. The recent shortage of coal had greatly increased the use of gas for heating; and much more would have been used if prices were lower. He therefore recommended one rate for lighting and cooking, and a special rate for heating—to be governed by the local conditions. The bye-product coke-ovens had proved that they could furnish a satisfactory supply of gas, which could be used to advantage by large companies when other conditions were right. Among recent novelties, were purifiers built with cement instead of iron, and high-pressure distribution. The Association had added two new features this year—a "Question Bureau," comprising answers to over 600 questions, and a "Department of Progress" intended to review all new methods, &c. The ballot on the proposed increase of dues to $4, ordered at the last meeting, resulted in an almost unanimous vote in the affirmative; and the way was now clear for publication of the proceedings.

The Wrinkle Department.

The Editor of this department, Mr. E. E. Eysenbach, of St. Paul's (Minn.), presented his report. The first item was an arrangement for working slide-valves at an angle from the upright, by means of an endless chain passing over pulleys. An electric alarm gauge consisted of an ordinary U-gauge with rather large tubes, having wires connected with a battery and an alarum adjusted at the desired height in the tubes. Natural gas companies used this device for high pressures, charged with mercury instead of water. Asbestos rope was recommended as preferable to the fire-clay and borings generally used for the joints of stand pipes in the retort-houses. In a double-floor retort-house, a 3-feet galvanized pipe was carried from the cellar to the ventilator, having a hood slightly larger than a coke-waggon at the lower end. Coke was quenched under this hood, and the steam thus got rid of without passing to the upper floor. A sprinkler for the scrubber comprised a dished perforated disc of copper suspended by a rod at the end of a ¾-inch supply tube. An ordinary intermittent syphon flush was improved by the additional of a seal cup, a large funnel on the top of the scrubber, and a second seal cup at the outlet of the funnel, with the object of preventing the syphon being affected by the pressure of gas in the scrubber.

Recuperative Furnaces.

A paper on the "Construction and Operation of Recuperative Furnaces," by Mr. Baehr, was read by Mr. H. L. Doherty in the absence of the author. As to the air supply, there was only one method of properly adjusting the primary and secondary air, and that was analyzing the producer and the chimney gases. The flue gases should be analyzed for carbonic acid, carbonic oxide, and oxygen; and it was well to adhere to solutions of fixed strength, and uniform methods of procedure. For taking samples of hot gas, he used a water-cooled tube made up of ordinary wrought-iron fittings. The sample tube, ½-inch in diameter, was enclosed in a double jacket made up of 1¼-inch and 2-inch pipe, and so arranged that water could be admitted at the end nearest the heat, flow up the 1¼-inch pipe, and return down the outer 2-inch tube to an outlet near the inlet. Various forms of apparatus were next described—including the Cooper tube, the Orsat-Muencke set, Hempel's apparatus, and methods of reducing percentage by volume to percentage by weight were given. He spoke strongly in favour of calorimetric determinations in respect to all fuels used, whether solid or gaseous, and of ascertaining the degree of heat efficiency actually obtained in practice. The specific heat of gases was considered at some length. It was stated that very few authorities had recognized that this varied with the temperature; and those who did, made variable or contradictory statements. Many gas engineers did not know that such a variation existed. He quoted at considerable length from "Nernst's Theoretical Chemistry," and alluded to the labours of Mr. Fred Bredel, of Milwaukee, on this subject. The water used under the clinker bed should be just sufficient to keep the temperature below the vitrifying point, and excess of water should be avoided. The supply should be under uniform head or pressure; and under such circumstances, the quantity delivered to each furnace should be accurately gauged by using a graduated measure and a stop watch. All adjustments of air or water supply, valves, or dampers should be left to one man. He had used the Le Chatelier pyrometer for determining temperatures, and found that the temperature above the fuel was 2000° Fahr., in the combustion chamber 2500° Fahr., at the outlet from the setting 1500° Fahr., and at the outlet to the chimney, after passing the regenerator, 750° Fahr. Detail estimates of heat efficiencies were next given. A full-depth furnace yielded 86 per cent., and a half-depth 73 per cent. As showing the effect of using excessive water, a half-depth furnace supplied with 1 lb. of water to 10, 8, 6, and 4 lbs. of carbon respectively, showed no appreciable variation in efficiency. With a full-depth the results would be different. Theoretically, the best shape for a producer furnace was a circle in horizontal section, and next to that a square. The fuel used should not only be of even thickness, but fairly even in size of lumps, as if there was much difference in size, the advantages of even distribution could not be secured. A shallow place or otherwise easy cut for the air through the fuel meant a local excessive temperature, the formation of carbonic acid where it was not wanted, and possibly of hard clinker. Producer practice had shown that in good working 12 lbs. of coal per square foot of grate area per hour might be consumed; but with retort furnaces, 8 lbs. of carbon per hour was a safer estimate. For reducing loss by radiation, hollow tile or brick was recommended; also the retort lids and mouthpieces should be lined with asbestos.

Mr. Bredel, being invited by the President to open the discussion, remarked that the temperature in the combustion chamber was low—too low, considering that the carbonizing temperature in the retorts should be 2000° or so. In his experience, the temperature at this point was above the melting point of platinum, or considerably more than 2470°. He used the Seamon selenium pyrometer, in which the electrical resistance was affected by the degree of heat. The cause of the author's low result might be the large quantity of water vapour pressure, which was necessitated by the great amount of ash to be dealt with. Mr. Butterworth said that, as supporting the contention for a wide furnace and large grate area, he might say that at Denver they had ten wide furnaces and ten narrow ones, little more than half as wide. With the same quality of coal, the narrow furnaces required clinkering four or five times as often as the wide ones.

Mr. Doherty, in replying, said that the time occupied in analyzing flue gases in regular working was inconsiderable. Once the conditions were determined, it was not necessary to take fresh analyses until some difficulty arose, or the quality of the fuel used was altered. Mr. Bredel's statement would indicate a temperature of over 3500°. He certainly never attained this, as the wires of his pyrometer had not fused at all. He could scarcely see how a large proportion of ash necessitated more water vapour. He rather questioned the soundness of the principles on which the selenium pyrometer was constructed.

Natural Gas.

Mr. F. W. Stone, of Ashtabula, O., contributed a paper entitled "Natural Gas as a Factor in the Artificial Gas Business." He said that over 50 per cent. of the gas undertakings in Ohio either had natural gas as a competitor, or were being abandoned in favour of natural gas. This statement scarcely covered all the truth, as the 50 per cent. included all the larger concerns; and he could only think of six cities in the State of 10,000 population

where natural gas was not used. It was certainly more than a coincidence that, in the regions where natural gas was most used, the price of the artificial product tended to run lowest. Natural gas would give as good a light with the Welsbach burner, and was as valuable for cooking and heating, as artificial gas; and it could be sold at one-fourth of the cost. Natural gas had, however, assisted them by increasing the demand for gas appliances and by advertising the use of gas, and was thus a valuable aid to districts where it was not available as a competitor. It had also taught the artificial gas makers the value of a large supply at a low price, and had originated high-pressure distribution. Then, even in the natural gas districts, they were looking ahead to the exhaustion of the natural product, which might come in a few years. When this happened, there would be towns of 10,000 inhabitants piped with 25 miles of pipe, and using 350 million cubic feet per annum, to be supplied; and one-third of this could be secured with a 650 unit gas at 2s. per 1000 cubic feet. He predicted that the demand for fuel gas would lead to the production of a cheap gas of good heating value, but possibly of lower illuminating power than that at present supplied.

Mr. Persons, being invited to open the discussion, remarked that his experience was entirely with artificial gas. He was not in the natural gas business, and had no intention of going into it. At Toledo, he had to compete with natural gas at 1s. 6d. per 1000 cubic feet, but was able to sell a considerable quantity of artificial gas at 2s. 11d. He had sold many stoves in districts where natural gas was formerly available, but where the supply was now stopped. His stove business increased 40 per cent. last year. Natural gas was a hard competitor that, in his opinion, would be with them for many years. The supply in his district was ample; but the appliances used were of a most primitive character; and therefore, with good first-class modern appliances, he could show as good results from artificial gas at more than double the price. There were higher flame temperature and other advantages. He went in for advertising, but relied chiefly on persistent personal canvassing. Mr. J. T. Lynn said that he was interested both in natural and in artificial gas. The natural gas business in Ohio was in a better condition now than at any previous time, and he did not think it would be played out for 25 years. It was possible that some of the smaller places taken on would soon be given up. Some excellent fields had been struck in West Virginia; and while at first it was sold recklessly at flat rates, sale by meter was now generally adopted—thus checking waste and conserving the supply. Natural gas might not be of much benefit to the present generation of artificial gas men; but it would eventually prove a help by acting as a pioneer. A certain small town was supplied with natural gas for five years; the consumption being 85 million cubic feet per annum. The supply having ceased, he followed up with an artificial gas-works, and commenced operations four years ago. The first year they sold 9 million cubic feet, and were now up to about 16 millions. His advice to those threatened with competition was either to sell out to the new comers, or to take the natural gas in bulk and utilize the present distribution system. Mr. J. W. R. Cline said that at Springfield there was an ordinance that natural gas should not be used for lighting. He supplied natural gas for fuel at 25c. per 1000 cubic feet, and artificial gas for lighting at $1.25. But they could not altogether enforce the ordinance, and many used natural gas for all purposes. Mr. Lynn said he supplied both sorts at Detroit, and had endeavoured to follow the rule indicated by Mr. Cline; but in his case, the Courts had declared that, after the gas passed the meter, the consumer could do what he liked with it, and could disregard any rule or contract to the contrary. He had sometimes found it practicable to lower the pressure of the fuel gas during the evening to a degree that rendered its use for lighting impossible. In the larger cities, he believed there was room for both gases; but the existing gas suppliers would experience a substantial cutting down of their dividends and income. The gas as now found in the southern and central parts of Ohio was as pure as coal gas, and could be turned straight into the mains and used in the same way. The natural gas at Detroit and Toledo, however, was not so pure. He could give some information as to the effect of an increased price on the consumption; having bought up two competing undertakings which were selling at 1s. 10½d. per 1000 cubic feet for fuel, and 3s. 4d. for light. Upon the amalgamation, the price was advanced to 3s. 4d. and 5s. 3d. respectively. This took place about five years ago. The population was 17,000. The first year they sold 18 million cubic feet; but last year they sold 62 millions. The decrease following the rise of price was less than 10 per cent. Of course, during the five years they had largely extended the mains; and the population had increased to 21,000. Mr. Light said that when natural gas was first brought to Dayton, he remarked that it would not last for ever, that the sooner it came the sooner it would be gone, and that in the end the consumers would be educated for his benefit. He had now arrived at that position. Last winter the natural gas supply failed at about 10 a.m. daily, and continued short all day. During the night the pressure would get up again; and then when people began to use it next morning, it would be all gone in three or four hours. It put him back but a very little; and last winter he had such a large increase that special efforts were required to meet it. Mr. C. S. Ritter had supplied natural gas in Columbus and in Detroit, and discontinued it about 18 months ago. According to his experience, the author was a little optimistic in expecting to retain a third of the business. Mr. H. H. Osborne said that at Chicago they had quite an experience with natural gas from Indiana. At first it was supplied by contract—a house of eight or ten rooms being heated throughout for £16 per annum. But the consumers were so extravagant that the meter system became imperative; and then the consumption fell off. The selling price was 2s. 1d. per 1000 cubic feet; and he could do a good trade against that with artificial gas at 3s. At these prices, people found the latter to be the more economical. He would like the author to explain how he was going to meet the large fluctuations in demand. Already they felt this at Chicago, although they had nearly 10 million cubic feet storage capacity. There was still a supply of natural gas; but it was dying out to some extent. His Company had foreseen the result, and prepared for it, which they could well afford to do, being a large concern with plenty of capital. In smaller towns he thought it would be difficult to take care of the position. The people were being educated in the use of gas; and there would be a large demand for artificial gas when the other stopped, and preparations were being made in anticipation. Mr. J. D. M'Ilhenny knew of a town where two companies were competing and selling at under 2s. per 1000 cubic feet. An amalgamation took place, and the price was raised to 3s. 4d. The first year the consumption fell off 20 per cent. or more; but in three years this was more than recovered, and a very satisfactory increase still continued. Competition might be deplored; but it certainly developed a demand for gas. Mr. Doherty alluded to the fluctuation in demand for heating gas, and thought that while it might be possible to meet a steady consumption at low rates, gas could not be sold for heating only at 4s. 2d. per 1000 cubic feet and made to pay. At Denver, if heating gas was supplied free, he could not distribute it to compete with coal. At present, his load-factor was 16 per cent. The distributing system was equal to 225,000 cubic feet per hour; and this quantity, multiplied by the number of hours in a year, represented six times the present output. But with heating gas, the load-factor would fall to 4 per cent. The lowest price for gas turned upon a high load-factor, and it could not be approached with a low load-factor. The solution of the matter lay in the system of charging, which was absolutely inequitable, and the gas business could not be properly developed on the 1000 cubic feet basis. It had been found impracticable to sell electricity on a kilowatt-hour basis, and they had to come to differential rates based on the load-factor. Gas companies would have to follow suit. Every consumer represented a certain capital investment regardless of his consumption; and the company had a right to a return on the investment, whether he used gas or not.

Mr. Stone, in replying, said that as the gas business developed the engineers must move with it. Probably no system at present in use was equal to the demands of a fuel-gas plant, either in economy or other respects. But he had faith enough in gas and gas engineers to believe that a solution of the problem would be forthcoming. In preparing his estimates, he also anticipated some improvement in gas appliances and in business methods; and when this was considered, he did not believe his estimate to be one whit too high. He had noticed that the average consumption per consumer of natural gas at Ashtabula was only about 60 per cent. of that in some older natural gas towns; and after careful inquiry, he found the cause was that the people were more economical in its use—they had been educated to some extent in the use of gas. He therefore believed that when they went back to artificial gas, he would be able to retain one-third to one-half of the business. This was his opinion after experiences with both gases in Ashtabula and careful inquiry elsewhere.

(To be continued.)

The London and Southern District Junior Gas Association will hold a general business meeting at the Regent Street Polytechnic next Friday. The proceedings will include a paper by Mr. W. Upton, of the London office of the Buenos Ayres Gas Company, entitled "The Future of the Gas Industry."

Prize for a Dust-Arresting Respirator.—The Council of the Society of Arts announce that they are prepared to award, under the terms of the Benjamin Shaw Trust, a prize of a gold medal or £20 for a dust-arresting respirator, the provision of which is considered as essential in many industries by His Majesty's Inspectors of Factories. The apparatus will be required to fulfil the following conditions: (1) It must be light and simple in construction; (2) it should be inexpensive, so as to admit of frequent renewal of the filtering medium or of the respirator as a whole; or, alternately, it should be of such construction that it can be readily cleaned; (3) it should not allow air to enter by the nostrils or mouth, except through the filtering medium; (4) it should not permit expired air to be re-breathed; (5) the filtering medium, though it should be effective in arresting dust particles, should not offer such resistance as to impede respiration when worn for some hours under the actual conditions of work; (6) it is desirable that it should be as little unsightly as possible. The prize is offered for a respirator intended merely to arrest dust, and not for a chemical respirator designed to arrest poisonous fumes. Specimens of inventions are to be sent not later than Dec. 31, to the Secretary of the Society of Arts, John Street, Adelphi, accompanied by full descriptions.

REGISTER OF PATENTS.

Incandescent Mantles.—Terrell, T., of New Court, Temple. No. 11,042; May 14, 1902.

The object of this invention is "to obtain mantles of greater flexibility and efficiency and of less cost than heretofore."

The patentee takes fine threads of cotton, linen, or other natural cellulose—containing (say) 35,000 to 45,000 yards to the pound, and preferably two or three ply—and soaks them in a concentrated solution of salts of the illuminating metals until the solution has thoroughly permeated the fibres. For example, he says, 2000 grammes of commercial nitrate of thorium (containing 48 per cent. of oxide) are dissolved in 1500 cubic centimetres of distilled water, and to this are added 20 grammes of commercial nitrate of cerium. In order to cause thorough absorption, the fibres may be left in the solution for (say) 48 hours. In some cases—particularly with cotton—the fibres may also be mercerized by treatment with potash, soda, or hypochlorites; and for more complete impregnation, the soaking may be performed in a vacuum, by means of which air will be replaced from the interstices of the fibre by the nitrate solution.

The soaked fibre is then pressed between india-rubber rollers to remove the solution from the surface; and the fibre is carefully and thoroughly dried—preferably in air at a temperature below 70° C., as at higher temperatures the nitrates may dissociate and attack the fibre. Before drying, the fibre should weigh from 2·7 to 3 times its original weight, and the dried fibre should contain about its own weight of salts. The dried threads are immersed in a concentrated solution of ammonia (preferably of specific gravity ·88), and are then washed in distilled water and dried, when they are ready for spinning or knitting.

The mantle manufactured by this process will, it is said, contain from 30 to 46 per cent. of anhydrous oxide, and the mantle can be burnt off and strengthened by collodion in the ordinary way.

Incandescent Gas Lighting.—Sugg, W. T., of Regency Street, Westminster. No. 11,069; May 14, 1902.

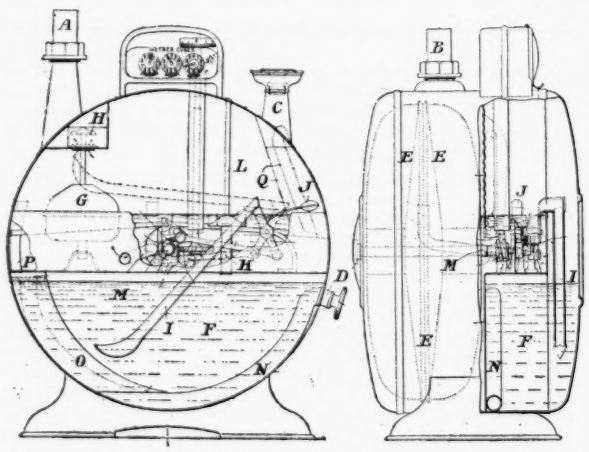
This invention has reference to supports for mantles and in adapting the mantle thereto.

The patentee forms the peg or pin and a cap on which the mantle rests of a compound of steatite dust and fire-clay, in the proportion of about 90 per cent. of steatite to 10 per cent. of clay, which ingredients are ground up together with a few drops of a binding material (such as silicate of soda), and then pressed in moulds to the shape required. The peg is formed with a socket which will fit on to a boss on the steatite burner proper; and the ordinary crutch is replaced by a point. The support proper is dome shaped with a skirt or downwardly curved flange on which the mantle rests, and in which are openings for the passage of the products of combustion.

Gas-Meters.—Boult, A. J.; a communication from La Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, of Paris. No. 11,614; May 21, 1902.

The gas-meter forming the subject of this invention is said to be "distinguished by an arrangement whereby the water measurement cannot be influenced either by a partial evaporation of the water contained in the meter, or by fraudulent manipulation."

The meter is provided with a gas-inlet tube A, an outlet-tube B, a tube for the introduction of water C, and an overflow D. The rotatory measuring drum E is preferably of the duplex type, which, owing to the great speed obtainable without injuring the operation of the meter, is especially adapted for actuating the parts which are arranged in such a manner that any evaporation which occurs takes place at the expense of the water contained in a supplementary reservoir F, but not of the water in which the drum revolves. The outer casing of the meter is



divided into two parts by a partition; the rear part containing the measuring drum, while the front part receives the subsidiary mechanism of the apparatus and the supplementary water-receptacle. A water-float G arranged in the drum-receptacle automatically cuts off the admission of gas by actuating a valve H in the event of the water-level in the meter becoming abnormally low. The shaft of the drum, which operates the registering mechanism by means of a screw, worm-wheel, and vertical shaft, actuates also a ladle I in the supplementary chamber by means of a crank, connecting rod, and pivoted lever. The ladle is balanced by a counterweight J, and serves for transferring water continuously from the supplementary receptacle F into the receptacle containing the measuring drum E; the quantity of water supplied in this way being always larger than the greatest amount of water consumed by evaporation.

A ratchet-wheel loosely mounted on the shaft of the drum, and driven by the ladle crank, constitutes, together with a pawl, a locking device which prevents the backward movement of the measuring drum and the syphon action which will be referred to later on. A pipe K is provided for regulating the water-level, through which the over-flowing water from the meter passes into the supplementary reservoir F. The bottom of the cup surmounting this tube is made of flexible material, so that the upper extremity of the tube can be adjusted in the vertical direction to the extent of some millimeters, by means of a rod L operated from the exterior. By this means, the measuring capacity of the drum can be adjusted until the indications given by the meter correspond exactly with the indications of a standard meter. After the adjustment, the projecting end of the rod is trimmed and soldered to the casing. A bent pipe or syphon M admits the gas to the measuring drum.

Upon the meter being charged, the water, after reaching the upper edge of the cup on the pipe K, overflows into it and down through the tube into the supplementary receptacle F, which can be filled up to the upper edge of the outlet-pipe N, which is U shaped and constitutes a hydraulic seal, so that the gas is prevented from escaping when the stopper is removed from the end which projects outside the meter. The U-shaped outlet-pipe also prevents the water contained in the reservoir F from being removed from the outside by suction or in any other manner. The inner end of the tube N is so arranged that there remains always a free space between the upper level of liquid in the supplementary reservoir and the lower end of the tube M by which the gas enters the measuring drum, even when a certain quantity of water flowing through the overflow-pipe K causes the level in the supplementary reservoir to rise during the operation of the meter. This may occur when the temperature of the water contained in the apparatus is lower than the temperature of the entering gas. In this case, a partial condensation of vapour contained in the gas takes place in the apparatus. Condensed water may be also formed in the inlet-tube and enter the apparatus. The quantity of water thus produced may cause the water-level in the supplementary reservoir to rise to the lower end of the measuring-drum inlet-pipe M before it would in any way influence the operation of the meter.

A sheath or plate O completely separates the entering gas (which has not been measured) from the upper extremity of the tube N—serving, as above described, for maintaining a certain water-level in the supplementary water reservoir F. The latter is thus divided into two compartments, which intercommunicate with each other through their lower parts underneath the lower edge of the sheath O.

A tube P is provided, the lower end of which is soldered to the horizontal portion of the partition, while the upper end opens above the water level in the meter into the space containing the measured gas, which by this means is brought into communication with the upper end of the U-tube N, and with the compartment of the supplementary reservoir F containing this tube. It is clear that, under these conditions, even if the water contained in the U-tube were removed from the outside, only measured gas could be withdrawn from the apparatus. The water removed from the pipe N would, moreover, be replaced as soon as the level in the supplementary reservoir was restored.

A similar device, serving also to prevent a fraudulent manipulation, is applied to the pipe Q for admitting water. This pipe is arranged in the part of the meter containing measured gas, and is surrounded by a tube or casing (closed at its lower end, and open at its upper end) which projects above the water level in the meter. This outer tube or shield therefore separates the water in the tube Q from the part in which the drum moves, and constitutes a water-seal which makes it impossible to lower the water-level in the meter by suction of water from outside the apparatus. Only the water contained in the casing tube can be sucked out; and the gas obtained in this way is again measured gas. By blowing into the water-inlet pipe, on the other hand, only the water contained in the water-seal would be forced into the meter. In both cases, only a momentary disturbance of the water-seal will take place.

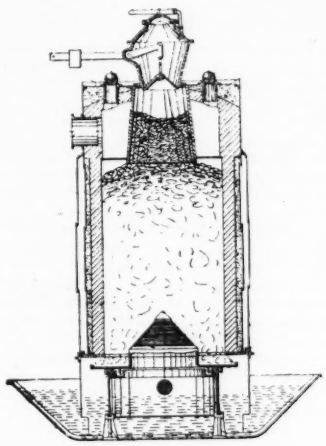
In order to prevent the syphon action which often occurs in meters of this kind during filling (especially when the stopper has not been previously removed), and which has the effect that the meter is emptied considerably below the normal level, according to the present invention, the rachet-wheel, which in ordinary meters is fixed to the shaft of the drum, is mounted loosely on this shaft, and is carried round during the rotation of the drum by a crank bearing against a projection or pin on the rachet-wheel. Owing to this arrangement, the drum E can move backwards to the extent of almost a whole rotation before being stopped by the rachet-wheel. If, therefore, the meter is momentarily overflowed during the filling, by water being poured in in excess, or in consequence of the overflow stopper not being removed, the measuring drum has sufficient play to rotate backwards when the level rises in its compartments, and to return to its normal position when the level descends again. Owing to this arrangement, no vacuum can be produced in certain parts of the meter, such as would, by its syphon-like action, cause an abnormal lowering of the water-level.

Gas-Producers.—Crossley, J. W., and Rigby, T., of Openshaw. No. 12,363; May 31, 1902.

This invention relates to the production of gas such as is commonly used to drive gas-engines and for heating purposes "with a view to increase the efficiency and to make them more easily managed with less labour."

The producer consists (as shown) of an inner vertical wrought-iron cylindrical casing lined with fire-brick, placed concentrically inside an external wrought-iron casing, which is carried lower than the internal casing and is enclosed so as to form a water-lute, which, by means of suitable water-sealed projections, makes a convenient arrangement for removing the ashes. The top of the producer is enclosed. A fuel feeding hopper, with valve, is fixed centrally on the top, with an

internal bell also fixed centrally so as to define the active depth of the fuel under combustion, and hold a reserve of fuel. The brickwork lining the internal casing rests upon a plate fixed to the bottom of the casing; and below this plate is a revolving grate on which the fuel rests. This grate is somewhat larger in diameter than that of the



brickwork, and is placed a few inches below the plate which carries the brickwork. The grate may be supported upon balls, so as to be easily moved; the balls, in their turn, resting on a cast-iron cylinder, which dips below into the water-lute in the bottom of the producer. All the air or air and steam which is passed through the fuel is brought into this cylinder. Centrally on the revolving grate, a conical arrangement of firebars, or an arrangement of plates with holes in them, is placed; the cone projecting upwards into the middle of the fuel. The air or air and steam is thus delivered centrally, and uniformly spread over a large area at the base of the fuel—thus giving facilities for the uniform distribution of the air which maintains combustion in the producer as it passes upwards through the incandescent mass. The gas is taken away from the top of the producer.

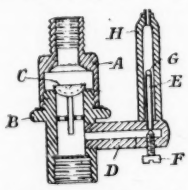
A suitable construction of the cone portion of the grate consists of flat annular rings of cast iron of gradually decreasing diameter. They are placed one above the other, thus forming the cone. The rings (either in one or more pieces) are internally arranged with suitable jaws and joggles, so as to drop over suitable driving horns, cast in one with the foundation plate. Distance-pieces cast on the rings maintain them at a suitable distance apart; thus forming air-spaces for the passage of the air. On the top of the cone a cap is placed, and bolted down if desired, so as to firmly retain the whole structure.

Incandescent Gas-Lamps.—Keith, J. & G., of Farringdon Avenue, E.C. No. 13,144; June 10, 1902.

These lamps are intended chiefly for lighting with high-pressure gas workshops and other buildings enclosing large areas. An illustrated description of the arrangement appeared in the "JOURNAL" for Dec. 30 last (p. 1749).

Self-Lighting Gas-Burner.—Shaw, S., of Richmond, Victoria. No. 13,647; June 16, 1902.

Under the bunsen portion of an incandescent gas-burner, the patentee proposes to place a small cylinder A, having a screwed nipple-top which connects with the bunsen (or alternatively with such other burner as may be used in lieu of the incandescent type). The cylinder is in the form of a screw-cover for screwing on to, and forming a dome of, a small vertical valve-box B. The top of the valve-box is provided with a screwed extension to fit the dome-piece; and its inner diameter has a circular valve-seat neatly cut and faced in it, so as to receive a specially constructed valve C. The valve-box proceeds downwards for a distance of about ¾ inch in the form of a cylinder; and at about one-third of the distance from its top, a small circular cross-plate is provided, and so sized as to fill its inner diameter. The circular cross-plate is arranged with one central and a number of other surrounding perforations—the central hole being for the purpose of forming a guide for the spindle of the valve C. Within the cylinder B, and slightly below the perforated plate, is screwed a rectangular pipe or horizontal circular box D, with a horizontal bore throughout its length of less diameter than the bore of the vertical cylinder. In the end of the box, and at the top, a small vertical pipe E of about ½ inch in height is screwed, and has an internal bore of about $\frac{1}{16}$ inch in diameter. The bottom of this pipe—that is, the portion that is screwed into the horizontal circular box D—has its bore directly over a small vertical screw-pin F. The latter screws up into the bottom of the box; the whole being so arranged that the screw-pin with its pointed end can be adjusted to control the entrance of gas into the bore of the small vertical tube.

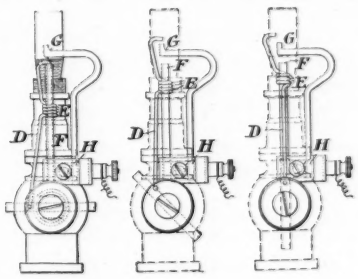


The invention works as follows: A small adjusted pilot supply-tube is arranged at the gas-supply cock. Through this the gas continually flows past the stopcock sufficiently to find its way up to and under the ball-valve G, where it escapes, or leaks away, through the serrated cuts, up the pilot-light tube fitted at H, at the top of which it continuously burns while the gas-burner proper is not alight. When it is desired to light the gas-burner proper, the main stopcock is turned on, so as to allow the full supply and pressure of gas to proceed forward under the circular valve C of the burner. The pressure of the gas lifts the valve a sufficient height, and allows the gas to reach the burner above, where it is ignited. Meanwhile, owing to the increased pressure and volume of gas accumulating at the ball-valve G, the ball will be blown upwards against the bottom of the pilot-light tube, thus preventing the light from burning.

Ignition Devices for Gas-Burners.—La Société Radiguet et Massiot, of Paris. No. 22,180; Oct. 11, 1902. Date claimed under international convention, April 9, 1902.

There are in existence, say the patentees, different types of electric gas-lighters in which a disruptive spark is produced above a pilot-tube, so as to ignite the gas issuing from the tube, and produce an ignition flame for the main burner. But such an arrangement is not applicable to incandescent gas-burners provided with a gallery supporting the chimney, since the moveable rod and tap-plug for producing the spark must be placed below the gallery, and the pilot-tube would thus be much too far from the burner proper to effect ignition under perfectly certain conditions. The present invention, therefore, has for its object an arrangement wherein the moveable rod designed to produce the disruptive spark moves parallel to the main burner passage—that is to say, vertically.

The plug of the gas-tap extends rearwardly through the body of the burner at the end opposite to that having the handle or thumb-piece; the projecting end having a neck to one side of which is fixed a metal wire D, the end of which terminates in several coils E enclosing the pilot-tube F. The rod D is secured at such a point that, when the handle of the plug is turned fully on, the point is at the top of its path. Above the pilot-tube is placed a spring-contact G, which is fixed at H

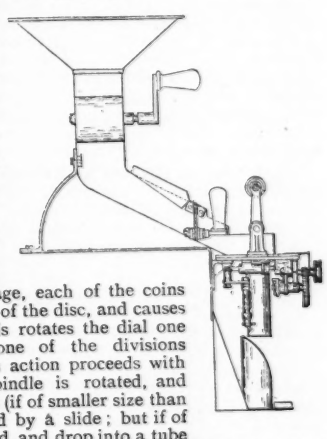


to an insulated portion of the device. This spring-contact is connected by a wire to one of the terminals of the source of electricity. The body of the device, and consequently the wire D, is connected to the other terminal of the source of electricity. When the burner is turned off, and the gas-plug is in the position first illustrated, the upper bent end of the wire D is above the upper end of the pilot-tube F. If, now, the tap be moved so as to first open the passage conveying gas to the pilot-tube F, the rod D rises, at the same time sliding up the pilot tube F. The upper bent end of the rod then comes into contact with the spring G, slides up it, and springs off its end, thereby forming a disruptive spark, which ignites the gas issuing from the pilot-tube. This flame will be communicated to the gas issuing from the main burner, which will be ignited at the moment when the parts are in the position indicated in the third figure and the passage of gas to the pilot-tube is cut off. By continuing to turn the cock-plug, the flame is regulated without igniting the pilot-flame. On turning back the plug in the opposite direction, the tap is completely turned off.

Coin-Counting Machine.—Mercer, A., and Meters Limited, of Manchester. No. 28,748; Dec. 30, 1902.

The patentees describe a coin-counting machine consisting of a receiving hopper fitted with agitating plates, and discharging the coins into a trough fitted with a baffle. The rotatable coin-carrier employed revolves above a plate provided with two holes for the discharge of the coins. A collecting tube is attached to the plate; and a winged disc intersects the path of the coin-carrier, and drives a graduated dial-plate. There is a cam arm operating a plunger normally pushed out by a spring; the plunger actuating an oscillating plate which normally closes the collecting tube.

When the mechanism here shown is being operated, the coins to be counted are thrown or tumbled into a hopper, and the agitating plates are operated, causing the coins to fall down a tube into the trough. The operator, by means of the baffle, permits a certain number of coins to pass into the pocket provided for the purpose; and at the same time he is turning the plate, and the coins falling into the gaps in it are carried round singly with it. In their passage, each of the coins abuts against one of the wings of the disc, and causes it to move one division. This rotates the dial one tooth—a distance equal to one of the divisions marked on its face. As this action proceeds with successive coins, the dial spindle is rotated, and with it a cam arm. The coins (if of smaller size than they should be) are discharged by a slide; but if of full size they are carried forward, and drop into a tube which is closed by a plate. When the predetermined number of coins



(say 60) have been collected, the cam has pushed the plunger back sufficiently to rock a rod so as to withdraw same. When it is fully withdrawn, the coins fall into a bag placed below. The plunger at this time is on the highest part of the cam; and the continued rotation of the latter enables the plunger to trip over the point of the cam—the action being instantaneous. In this way, the slide shoots into the slit, and closes the latter before another coin can fall. The period at which the slide shoots into the tube is coincident with the registration of the maximum number on the graduated dial; and after the coins are discharged, the operation is repeated. By this means, it is not necessary to handle the coins at all during the process of counting.

APPLICATIONS FOR LETTERS PATENT.

9472.—GRUNDTVIG, C. F., "Acetylene generators." A communication from Borlido Moniz and Co. April 27.
9494.—PRYOR, H. A., "Acetylene gas-generators." A communication from La Société Rejna Zanardini et Cie. April 27.
9504.—LINDEMANN, O., "Gas-producers." A communication from E. Körting. April 27.
9524.—ROBERTS, J., and DOWSE, J. T., "Brush for cleaning incandescent burners." April 28.
9552.—HARRIS, H. W., "Lighting and extinguishing gas at predetermined times." April 28.
9566.—FOX, P. G., "Incandescent gas-burners." April 28.
9653.—HOLLIS, W., "Fastener for purifier covers." April 29.
9660.—HOLLIS, A., "Regulator for use with gas plant." April 29.
9671.—YOUNG, A. F., "Automatic coin-counting mechanism." April 29.
9691.—DENAYROUZE, L., "Incandescent hydrocarbon vapour lamps." April 29.
9706.—REID, J., "Burner for mixing oxygen with acetylene." April 29.
9733.—BOUSFIELD, J. E., "Gas-washers." A communication from H. Gerdes. April 29.
9771.—JACKSON, J. P., "Gas-generators." April 30.
9815.—ALEXANDER, C. J., "Forks for incandescent mantles." April 30.
9818.—ROWE, R. M. L., and BICKERTON, R., "Gas-producers." April 30.
9850.—LANCHESTER, F. W., "Gas and oil engines." May 1.
9856.—PLATT, J., "Incandescent gas-burners." May 1.
9937.—LANCHESTER, F. W., "Internal combustion engines." May 1.
9950.—BOYD, H., "Gas-producers." May 2.
9962.—JAMESON, J., "Incandescent street lighting." May 2.
10,005.—CLARKE, E. F., "Burners for gas-stoves." May 2.
10,015.—M'MULLEN, J. A., and ROBINSON, M. H., "Gas-engines." May 2.

Sales of Shares.—Messrs. Edwin Fox and Bousfield sold at the Mart, on Wednesday last, £300 stock of the Horley District Gas Company at £100 5s. per cent.; also 52 £5 shares in the Goring and Streatley District Gas and Water Company, Limited, at par. On Thursday evening, Mr. A. G. Bonsor sold £400 of 5 per cent. consolidated ordinary stock in the Kingston-on-Thames Gas Company for £460, and 50 7 per cent. "B" £10 shares in the Hampton Court Gas Company at £16 each.

Reductions in Price.—The Sowerby Bridge Urban District Council have decided to reduce the price of gas to local consumers from 2s. 6d. to 2s. 4d. per 1000 cubic feet; to out-district consumers, from 3s. 4d. to 3s. 1d.; and to Luddendenfoot consumers, from 3s. 9d. to 3s. 4d. At the quarterly meeting of the Rochdale Town Council on Thursday, the price of gas for lighting purposes was reduced, on the recommendation of the Gas Committee, from 3s. 2d. to 2s. 10d. per 1000 cubic feet within the borough.

Southampton Gas Company.—The report of the Southampton Gas Company for the half year ending Dec. 31 states that the amount available for dividend, after payment of debenture interest and all other charges, is £17,404. The Directors recommend the payment of the maximum dividends and the placing of £2000 to the reserve fund, which will leave £4389 to carry forward. There was an increase of 23½ million cubic feet in the quantity of gas sold in the six months, as compared with the December half of the previous year.

Southport Gas Profits.—The net profits realized by the gas undertaking of the Southport Corporation for the past financial year amount to upwards of £10,000, according to a statement made by Mr. E. Trounson, the Chairman of the Gas Committee, last Tuesday. This will enable the Committee to hand over £8000 in relief of the rates, as promised, and wipe off the deficit of £2000 standing over from last year. Several of the extensions of plant, &c., have been paid for out of revenue. The gross profit represents more than 9 per cent. on the total outlay upon the undertaking.

Reduction of Leakage at Rotherham.—As mentioned last week, the working of the Rotherham Corporation Gas Department for the year ending March 25 resulted in a net profit of £4053. In submitting the annual statement at last week's meeting of the Borough Council, Alderman Gummer congratulated the Council on the turn of the tide. He drew attention to the fact that, while they had made 6 million cubic feet of gas less than in the previous year, they had sold over 2 millions more. This was due to a decrease in the leakage from 11 per cent. to a little over 8 per cent. The increased profit had been chiefly brought about by a lower cost of coal. There had also been a saving by the use of oxide instead of lime for purifying, estimated at from £700 to £800 per annum. He warned the Council against the increased expenditure on public lighting. In 1901-2, the cost was £4120; and in 1902-3, it was £4699, or an increase of over £500 for one year. If this was to continue, there would be no hope of profit being handed over for the relief of the rates.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Price of Gas for Power Purposes.

SIR,—I believe it has never been contemplated, either by yourself or any of your correspondents who have discussed this question, that gas for power should be supplied at a loss. The letters which have appeared in the "JOURNAL" from Mr. Bancroft and "F.G.N." are helpful in setting forth the *pros* and *cons* of the subject.

The latter correspondent truly remarks that "the practical question to be answered is Can the price of gas for power be reduced without doing injustice to other consumers." I quite agree with him that it would be doing a great wrong to the consumer of gas for lighting, to burden him with any of the cost of gas for power. I am quite convinced that a considerable reduction can be made from the ordinary rate, and the consumer of lighting gas not only suffer no wrong, but be advantaged thereby. Our ordinary charge of 3s. per 1000 cubic feet for gas, includes 14·56d. for dividend and interest; and with the slow growth of consumption we experience, it will in all probability remain at that for a long period to come. The only hope of improvement for the lighting consumer is a development in the consumption from some other quarter. So when a customer for a considerable quantity of gas for power comes along and says that he will take a supply if he can have it at 2s. per 1000 cubic feet, we take him on. Why? Because his is mainly a day demand, and nearly equal day by day throughout the year; because in working expenses there is little beyond the cost of manufacture to meet his requirements; because of the smallness of the capital outlay to meet them; and because such capital as is expended on his behalf, would, under the auction clauses, be raised at something below 5 per cent. interest, and it would certainly not require more than about 4d. out of every 1000 cubic feet of gas sold to him to pay dividend.

I find, on going carefully into the matter, that at these works, the cost of manufacture (less residuals) is 12·67d. per 1000; and if 1d. be added for distribution, another 1d. for rates and taxes, and 0·33d. for management, the net cost of the power gas comes out at 15d. per 1000. I do not add anything for leakage, as shown in Mr. Bancroft's examples, because the costs given are calculated on the gas sold, not on the gas made. If the gas for power be sold at 2s. per 1000, it leaves a profit of 9d. per 1000. Under such local circumstances, a reduction of 33 per cent. on the ordinary rate is warranted, as it will pay its way, and leave a surplus to help the reduction of lighting gas. I should much like to meet with customers for power gas at 2s., who would add 50 or 100 per cent. to our present sale, and should not hesitate to undertake to supply them.

The large discounts given to some users of gas for lighting purposes—such as factories, &c.—are not at all justifiable when the conditions under which the gas is taken are compared with those attending power gas. It is expediency which accepts them as customers. They are to be had at a low price or not at all. So, generally speaking, is the power gas consumer.

It is misleading and confusing to assert an abstract right for consumers of gas for lighting to have a supply on equal terms with power consumers—*i.e.*, at the same price. The lighting consumer gets what abstract right he is entitled to when he is furnished with gas at the cost of producing and placing it at his service, *plus* the dividend and interest on the capital expended for the purpose, and some contribution to insurance funds. He has no abstract rights beyond that; and he suffers no moral wrong if the power gas consumer comes along and helps him to get his gas cheaper.

In looking through Mr. Bancroft's answer No. 2, I notice (in arriving at the cost per 1000 cubic feet of gas) he has included 2·02d. for dividend or interest; but he follows this by the remark that "the whole establishment would be worked without profit or additional pay to turn out more gas at cost price." This seems contradictory. It would make his statement clearer if he would give the manner in which the item of 2·02d. per 1000 for dividend is arrived at. Further, as rates and taxes are somewhat proportioned to profits, if there are no profits why allow for an increase under that head? Mr. Bancroft also omits any charge for distribution, &c., assuming it is unnecessary to do so. That is, however, hardly a prudent course, as there must necessarily be some additional expense attending the supply.

HENRY TOBEY.

Malton, May 8, 1903.

SIR,—It may interest you and your readers to know that since August, 1900, this Company have been selling gas for "power purposes" and allowing a discount of from 33⅓ per cent. to 50 per cent. (according to the quantity consumed per annum) off the usual charge for gas for lighting purposes. Gas-stoves and boiling-rings receive a discount of 25 per cent. Owing to the low cost of gas for power, we have upwards of 30 gas-engines in Colombo, varying from ½ to 50 brake horse power. There are only six electric motors in use in Colombo just now, although formerly there were many more.

STEPHEN WELLINGTON,
Secretary and Manager.

Colombo Gas and Water Company, Limited, April 22, 1903.

The Periodicity of Drought and Rain.

SIR,—I have no desire to enter into a discussion of the Brückner or any other cycle; for in the last forty years I have seen the birth and death of so many cycles that have satisfied their authors, that I am sceptical as to any periodicity in English rainfall. At the time of the correspondence in "The Times," to which you refer in the article in your last issue, I had the curiosity to undertake the discussion suggested in the letter of "A Fellow of the Royal Meteorological Society;" and your readers may perhaps be interested in the result.

In the article published in "The Times" on the 13th of April, the

centres of dry groups of years are given as 1795, 1830, 1860. In the letter published on 18th, they are given as 1833, 1863, and 1897. I took the latter dates for examination, and, in accordance with the suggestion of "F.R.Met.Soc.," compared with the Greenwich record and with a well-known record for London from 1813 to 1872 compiled by the late George Dines—thus obtaining a practically continuous record for 90 years. The three dates quoted are complete cycles, and therefore the opposite condition should appear at the intermediate dates. We have then 1897, 1880, 1863, 1848, and 1833, and (half 35 years farther back) 1816.

For comparison, I take the rainfall of the seven years in which the before-mentioned dates are central, and give the amount which the average for the seven years was above or below the average of the whole period :—

Average Rainfall for the Two Records.

London	1813 to 1872	24·56 in.
Greenwich	1840 ,, 1902	23·89 ,,

Difference of the Rainfall from the Average.

	Centres of Groups.	London.	Greenwich.
Minimum.	1894 to 1900	—	— 1·79 in.
Maximum	1877 ,, 1883	—	+ 3·27 ,,
Minimum.	1860 ,, 1866	+ 0·96 in.	+ 0·97 ,,
Maximum	1845 ,, 1851	— 1·79 ,,	— 0·75 ,,
Minimum.	1830 ,, 1836	— 0·37 ,,	—
Maximum	1813 ,, 1819	+ 0·68 ,,	—

This shows: For the three minimum periods (1) a large deficiency, 1·79 inches; (2) a considerable excess,o ·96 inch; (3) a small deficiency, 0·37 inch. For the three maximum periods (1) a large maximum, 3·27 inches; (2) a large minimum, 1·79 inches; (3) a moderate maximum, 0·68 inch.

By this examination, the weight of evidence is slightly in support of the cycle, but not sufficiently so to justify an agriculturist in risking financial loss by acting upon its indications. An antagonist of the cycle would point out that in the table the periods, instead of yielding a maximum and minimum alternately, give two maxima and two minima together, and that, therefore, the indication is that we have another minimum to come, to compare with the 1894 to 1900 minimum. Is not this deduction as justifiable as the other?

A Member of the Scottish Meteorological Society.

May 7, 1903.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bills brought from the Commons, read the first time, and referred to the Examiners: Sittingbourne District Gas Bill, Walker and Wallsend Union Gas Bill.

Bills read a second time and committed: Bath Corporation Water Bill, Bridgwater Gas Bill, Broadstairs Gas Bill, Burgess Hill and St. John's Common Gas Bill, East Ardsley Gas Bill, Ipswich Gas Bill, North Middlesex Gas Bill, Sutton District Water Bill, Winchester Water and Gas Bill.

Bills reported: Birmingham Corporation Bill, Rickmansworth Gas Bill.

Bills read the third time and passed: Harrogate Water Bill, Harrow and Stanmore Gas Bill, Rickmansworth Gas Bill, Wellington (Salop) Gas Bill.

The Gas Orders Confirmation Bills (Nos. 1 and 2), the Gas and Water Orders Confirmation Bill, and the Water Orders Confirmation Bill were presented on Monday last week, read the first time, and referred to the Examiners.

The Bury and District Joint Water Board Bill and the Torquay Corporation Water Bill have been referred to a Select Committee, consisting of the Earl of Camperdown (Chairman), the Earl of Lathom, Lord Redesdale, Lord Cheylesmore, and Lord Llangattock; to meet to-day.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Bills brought from the Lords, read the first time, and referred to the Examiners: Harrogate Water Bill, Harrow and Stanmore Gas Bill, Wellington (Salop) Gas Bill.

Bills reported: Crystal Palace District Gas Bill, Ebbw Vale Water and Improvement Bill, Hampton Court Gas Bill, Hyde Corporation Bill, New Hunstanton Improvement Bill.

A Bill to confirm certain Provisional Orders of the Local Government Board, relating to Cudworth, Hucknall-under-Huthwaite, and Meltham, was brought in by Mr. Grant Lawson and Mr. Walter Long on Monday last week, read the first time, and referred to the Examiners.

A petition against the Hexham Gas Bill [Lords] has been presented by the Hexham Urban District Council.

Under the auspices of the Guildford Gas Company, an exhibition of gas appliances, manufactured by Messrs. Fletcher, Russell, and Co., Limited, was opened in the Large Hall in the town on Tuesday afternoon, by Mr. C. S. Heard, one of the Directors of the Company. There was a large and varied collection of stoves, &c., while suspended from the roof were five Lucas lamps, another being placed over the entrance. Penny-in-the-slot meters, of which there are already about 850 in use in the town, each supplied with a cooker, were on view. We learn from the Secretary (Mr. W. Titley) that a great incentive to the employment of these appliances has been given by a recent reduction in the price of gas. The exhibition remained open till Friday; cookery lectures being given twice daily by Miss Helen Edden.

GLEANINGS FROM THE COMMITTEE ROOMS.

The most voracious for work among those engaged professionally in certain branches of Private Bill Legislation could not complain of the supply in the Committee rooms last week; but it may be opined that some of the leading Counsel and Parliamentary Agents would have been glad if the superabundance that they had to deal with had been distributed over a longer space of time. Stress of work in the Committee rooms does not conduce to the advantage of the Bills on which these legal gentlemen are engaged; for the Bills do not get that measure of continuous attention, at all events from the legal leaders, which they deserve and require. The many interruptions in this individual attention is one of the causes contributing to the drawing out of the proceedings on Bills to an inordinate length. But this, however objectionable, has, under present circumstances, to be tolerated. But the pinch of the week was not found in the gas measures that were under consideration; those that are opposed are growing beautifully less. The measures relating to railways, tramways, electricity and gas power supply, and local authority General Powers Bills were the ones that bulked largely. Notwithstanding, there are several Bills—Gas and Water—to which reference has to be made in these notes. The two Bills referring to the Gaslight and Coke Company were not removed from the list of those referred to Sir John Brunner's Committee. One day the asterisks (which denote that Bills will not be considered the day or days they appear) were removed from these Bills. That was Thursday; and in the morning the Governor and several of the Directors and officials of the Gaslight and Coke Company were hovering about Room 13—apparently in the expectation that there would be an announcement respecting the Bills in which they are concerned. As was announced last week, the points on which the Company and the opponents have been at variance have been settled; but nevertheless towards the end of the week Counsel were still being retained in connection with both measures. Friday saw the Bills again with asterisks attached; and then came the information that the release from all the trouble in connection with Metropolitan gas affairs—excepting, of course, whatever may arise in connection with the Departmental Committee on Gas Testing—would take place to-day (Tuesday). Whether the release will mark the beginning of a long or short period of peace is more than one cares to predict. That will rest entirely with the management of the Company. The interesting measure promoted by the Crystal Palace District Gas Company, in all the proposals of which can be traced the hand of the Chairman (Sir George Livesey), occupied the sittings of Sir John Brunner's Committee on Wednesday, Thursday, and part of Friday. The gas section of the Birmingham Bill was won easily and early in the week; the Derby Bill has been practically settled, and is not likely now to trouble the Committee to whom had been delegated the task of investigating it; the North-Western Electricity and Gas Power Bill, against which there appear a formidable rank of opponents, including gas-supplying corporations and companies, was started on Thursday; and quite a number of Bills devoted entirely, or including sections referring, to water supply were also disposed of. From this summary it will be seen that the week has not been an altogether barren one; but it has brought us a long step nearer the end of the Bills in which "Journal" readers have any immediate concern.

The Gaslight Terms of Settlement. We refrained last week from mentioning the terms of the settlement in connection with the Gaslight and Coke Company's Bill, and the Gaslight and Coke Company's Acts Amendment Bill, promoted by the County Council. But the embargo laid upon us has been removed by the presentation last Thursday to the Common Council of the City of a report on the subject by the Streets Committee. It stated that the London County Council had come to an agreement with the Gaslight and Coke Company, the effect of which was that the County Council would withdraw their Bill, and the Company would give an undertaking on the following lines: (1) To reduce the amount of new capital to be asked for from £1,000,000 to £750,000. (2) To reduce the standard price of gas from 3s. 9d. per 1000 cubic feet to 3s. 4d. The standard price proposed in the Company's Bill was 3s. 6d. for 16-candle gas; while that in the London County Council's Bill was 3s. 1d. for 14-candle gas. (3) To set aside out of divisible profits above the statutory dividend of 4 per cent., sums of £10,000 to £40,000, if the dividend reached £5 8s. per cent., for the purchase and extinction of ordinary stock, until £1,000,000 of such stock shall have been purchased and extinguished. (4) The Company to give an undertaking not to charge for meter-rents extinguished by them some years ago. Under these circumstances, the Streets Committee did not think it wise to press for further concessions, and recommended that their petition be withdrawn, and the Bill be no longer opposed. The Court agreed with the Committee. The Directors were wise, after their recent experiences in Parliament, in making the sacrifices set forth here in order to gain their Bill. What would have happened if the rival Bills of the Company and the County Council had come before Sir John Brunner's Committee, with their strong liking for cheap gas, is very questionable.

Crystal Palace Gas Bill—Making History. The Committee of Selection of the House of Commons could not have found a better set of men to consider a Bill of the character of the Crystal Palace District Gas Company than those who constituted the Committee who for the best part of three days last week—from Wednesday to Friday—heard, and contributed to, the discussion of the many-sided measure promoted by the Crystal Palace District Gas Company, the passing of which intact by the Committee is an important event in gas legislation, for it carries us a step beyond what has been accomplished in the last three sessions. When the South Metropolitan Gas Company obtained their Act in 1900, empowering them to reduce the illuminating power of their gas from 16 to 14 candles, it was said that the success was fraught with important issues; and this Crystal Palace Bill is one of them. It has passed the Commons Committee; and as Sir George Livesey puts it, "the Committee have made history; and their action will be of the greatest advantage to the country generally." As is known Sir John Brunner

has a connection with the manufacture of cheap gas for power purposes; and his knowledge of the subject was of immense advantage to the promoters. He showed throughout the proceedings something more than a superficial acquaintance with the requirements of the times, and with the questions of gas enrichment, purification, and testing; and this had the effect of materially shortening the time that would otherwise have been consumed by the opponents. Still the proceedings were protracted, as many points were involved. There was the question of the reduction of the illuminating power, the lowering of the initial price, the method of testing, the proposed exemption of the Company from the sulphur clauses, and the acquisition of additional lands. These were the subjects of contention; but to all the other matters there was no objection—for example, the question of the issue of stock to the consumers and employees, the appointment of workmen directors on certain conditions, and the change of the title of the Company. The Company had a considerable body of witnesses present; but only five were called—Sir George Livesey, Mr. S. Y. Shoubridge (the Engineer), Mr. Henry Hack, Professor Lewes, and Dr. Rideal. The opponents were the London County Council, the Lewisham Borough Council, the Beckenham District Council, and the Leathersellers' Company (who were interested in the land clauses). The opponents also had several witnesses present; but of them, owing to the Chairman's several pointed declarations, only three were called—Mr. Isaac Carr, Mr. C. R. Bellamy, and Dr. Armstrong. Their evidence, however, did not make the slightest impression on the Committee.

13-Candle Gas, Sulphur Compounds, and other Matters. The preamble of the Bill having been proved, a brief reference to the four main points of contention will suffice. The Bill proposed that the standard illuminating power should be reduced from 15 to 13 candles, which is a candle lower than has been ventured upon since the memorable parliamentary battle of 1900. There is no need to repeat the arguments so often submitted in favour of the supply of cheap gas; but Sir John Brunner showed his grasp of the position when he advanced the opinion that manufacturers of gas should be free to take advantage of scientific improvements affecting their undertakings, and of which improvements consumers would not get the advantage unless gas manufacturers had freedom. It rather confounded the opposition when he, with characteristic candour, also stated that, if he were in the witness chair, he should give it as his opinion that it would be an enormous benefit to the country if gas could be made of 8-candle power. The reduction of the illuminating power in the case of the South Metropolitan Company to 14 candles in 1900, Sir George Livesey admits, was but a tentative step; and he finds the 14 candles a bit too high to expect to get regularly from the ordinary coal supplies. Hence the proposal to reduce the illuminating power to 13 candles in the case of the Crystal Palace District Gas Company. In connection with the larger Company, too, it has not been the experience that the reduction in illuminating power has caused any increase in the amount required by the consumers. One point in connection with this matter upon which too much stress cannot be laid is that the local authorities seem to overlook entirely the fact that, under the sliding-scale, any economies effected go to the consumers to the extent of seven-eighths as compared with only one-eighth to the shareholders; and, furthermore, in most towns now, if consumers are not satisfied with the gas supplied, there is the electric light. However, the decrease of the illuminating power to 13 candles, the Company proposed, should carry with it a reduction of the initial price from 3s. 2d. to 3s., and of the lower limit of the neutral zone from 2s. 10d. to 2s. 9d. It was contended by the opposition that this was insufficient for the 2 candles reduction; but Sir George proved from the experience of the South Metropolitan Company that it was reasonable. He, however, conceded this much before the inquiry ended—that, if the Company were allowed to reduce the illuminating power to 13 candles, he would pledge himself to reduce the selling price 1d. immediately after the passing of the Act, and then they would try their hardest to bring it down another 1d. within six months—thus giving the consumers something like £10,000 a year. On the question of the testing of the gas, the Company asked for the South Metropolitan clause. The County Council objected to any alteration of the method of testing; but again Counsel for that body were somewhat nonplussed by Sir John Brunner's blunt statement that he thought Parliament was waking up to the idea that, instead of enforcing rigid rules for this purpose, they would be willing for the best available testing apparatus to be used from time to time. Then Counsel altered his attitude somewhat; and tried to conciliate the Company by asking them, if they would consent to abide by the decision of the Board of Trade Departmental Committee on testing—the same as the Commercial Gas Company. He did not realize that he was touching one of Sir George Livesey's sore points, until that gentleman began to talk of "persecution," "tender mercies," and so forth. He found Sir. George inflexible in refusing to take the first step towards submitting the Company to the "tender mercies" or the "persecution" of the County Council. Regarding the proposed exemption of the Company from the sulphur clauses, they have, as recent litigation has shown, had troublesome times over the nuisance occasioned by spent lime. The opponents, of course, objected to their release from the restrictions; or, if relieved, they asked for some concession in price to the consumers on this score. But this could not be granted; and it was again proved that the consumer was well protected on account of any savings effected, by the operation of the sliding-scale. In this connection, too, the Chairman intimated that, with so many instances [see the next paragraph] in which gas was supplied without the imposition of the sulphur clauses, it was useless for the opposition to persevere in any effort to try to prove that the removal of the restrictions would hurt anyone. So hard pressed were the opponents by the Committee's confessions, that early on Friday morning they withdrew, excepting Lewisham on one point, and that was the question of the provision of a testing-station at Forest Hill, and this was conceded. The withdrawal, however, looks like a renewal of the opposition in the Upper House. Meanwhile the Company and all engaged on this interesting Bill have reason to congratulate themselves and to be congratulated on its safety so far as it has progressed.

Sulphur Restrictions. In the course of his evidence on the Crystal Palace District Gas Company's Bill, Sir George Livesey put in a 27 page foolscap pamphlet in which were tabulated the gas undertakings in the United Kingdom which have been authorized by Acts of Parliament or Provisional Orders from the year 1860 to the end of 1902. The object of this list was to show the number who were restricted in regard to sulphur, and the extent of the restriction. This struggle which Sir George has so long waged over the harassing limitations imposed upon a comparatively few gas undertakings, he brought, as will have already been seen, to an interesting point last week—both in connection with the testing of gas and its purification. In the latter regard, the tabulated statement here referred to will be of very great service in the future. It was in 1860 that the sulphur clauses were introduced; and since then 692 gas undertakings have been in Parliament, 476 of which were companies and 216 local authorities. But the amazing feature is that, of this total of 692 undertakings, only 51 have sulphur restrictions. Two only of the 216 local authorities are restricted; all the rest being free. One of the two is not tested at all; but the other is at the works. As to the 476 companies, only 49 have sulphur restrictions, 4 of which are tested daily for sulphur, 25 are tested occasionally, and 20 are not tested at all. In the cases of Birmingham, Barnstaple, Hebden Bridge, Loughborough, Todmorden, and Walton-on-Thames, the sulphur clauses have been repealed. The fact that only 51 out of 692 gas undertakings have any sulphur restrictions is the best comment one can have as to the futility of the anxiety and expense which they occasion. The Crystal Palace District Gas Company have succeeded in their first step towards relief from the burden; and perhaps many (if not all) the remaining fifty undertakings will, when occasion offers, make a similar fight for relief. The particulars stated here will then be found exceedingly useful.

The New Gas-Works for Birmingham. On Monday afternoon and the two following days, the walls of Committee Room No. 1, in which Lord Newton and his colleagues were sitting, looked strange. There were very few yards of space that were not covered by highly coloured maps and diagrams of extensive area, which told an interesting tale as to the district supplied with gas by the Birmingham Corporation, the proposals to construct large new works at Erdington, and the great increase which has taken place in the gas consumption of the district. During those days, the Committee were considering the section of the Bill in which the Corporation asked for sanction to construct new works on the 120 acres of land which they have already acquired at Erdington, and for which and for other gas-works purposes they requested authorization to the borrowing of £500,000. Lord Newton, as a Chairman of a Select Committee, has already proved himself this session eminently capable. He has a happy knack of soon ferreting out the points on which opponents feel aggrieved, and require concession or complete expunction; and then of keeping discussion closely to those points. There was the making of a wordy fight over this new gas-works scheme, albeit there were only two petitioners—Mr. Richards, who owns an estate called "The Rookery," and the Erdington District Council; but his Lordship was not long in narrowing down the whole matter, so far as the promoters were concerned, to showing that the site was a satisfactory one and to the question of urgency, and the opposition to disproving (if possible) the Corporation's contentions and to argument on the subject of damage to the locality. The fact that just to the south of the site is a sewage farm, at which the sewage of a population of 800,000 persons is treated, disposed of all question as to any injury being occasioned to the amenities of the district by the creation of gas-works there. Regarding the suitability of the site, the Engineer-in-Chief to the Gas Department (Mr. Henry Hack) has failed to find another that is "so admirably adapted" to the purpose of gas-works as this one; and the opinion of Sir George Livesey is that the site is "an ideal one." It is near the Midland Railway, is bounded on one side by the Birmingham and Fazeley Canal, and is within easy distance of the area to be supplied, and especially those parts which are rapidly increasing in population. As to the question of urgency, the testimony of both the Chairman of the Gas Committee (Mr. Bishop) and Mr. Hack could not be refuted. When the Corporation became possessed of the undertaking in 1875, the production of gas was 14½ million cubic feet per day; and at the present time the maximum producing power is 39¾ millions. Extensions on the present sites will raise the productive capacity to 42½ millions, which, with an allowance of 10 per cent. for reserve, will bring the safe capacity down to 38¼ millions. It will be absolutely necessary to begin the construction of the works at the end of next year or the beginning of the following one; and the section which will then be taken in hand, including the railway, will cost about £500,000. It is quite clear that it would have been highly imprudent for the Corporation to have made further delay in approaching Parliament. As to the opposition, it appeared that Mr. Richards has largely developed his property for fruit-growing, as a business. The evidence as to whether the gas-works would injure the property for this special purpose was contradictory; but, in view of the suspected damage the works would cause him, he asked their Lordships to declare the preamble of the Bill not proved so far as it related to these works. The District Council—quite oblivious to the presence of the sewage farm—considered "the charm" of Erdington as a residential suburb would be destroyed. But all their evidence in this regard was based on pure presumption. Support to the opposition was accorded by Mr. E. H. Stevenson; and he joined issue with Sir George Livesey as to the site being an ideal one, both from the point of view of location and its costliness from an engineering standpoint. He was perfectly satisfied, speaking as an Engineer, that there were other sites which would be better. Lord Newton and his fellow members were fully conscious that any district would rather be without gas-works; but gas-works were a necessity for Birmingham. Two minutes sufficed the Committee in arriving at the decision to dismiss the petitioners; but the Erdington representatives went away fully believing that the verdict was against the weight of evidence. If the Bill proceeds as successfully as it has started, Mr. Hack will soon find himself in the midst of the heavy preliminary work which a new scheme of this magnitude demands.

Derby Gas Bill. It was anticipated that this Bill—the consideration of which had been referred to a Committee, with no possibility of its being reached for some days yet—would have given rise to strenuous opposition. But during the past week, Mr. J. Ferguson Bell, the Company's Engineer, was at Westminster in consultation with the agents and experts engaged in connection with the measure; and before the end of the week, it was learnt that terms had been practically arranged between both the Company and the Corporation. It seems to be merely a question of clauses between them now. The provisions of the Bill were noted in the "JOURNAL" for Jan. 13 last (p. 98). The lines on which the settlement will run are: A slight reduction of the capital will be made; and in connection with the standard price there is to be a neutral zone between 2s. 10d. and 3s. 1d. The Corporation have consented to the restriction as to sulphur being extended to 25 grains—the present limit being 20 grains. The petition of the Draycott Gas Company has been withdrawn, as the promoters have eliminated from the Bill the parishes of Shardlow and Great Wilne. The witnesses retained for the Company were Sir George Livesey and Mr. Charles Hunt; and for the Corporation, Mr. H. E. Jones, Mr. Alfred Colson, and Mr. T. Berridge.

Walker and Wallsend Opposition. As was presaged when the Bill of the Walker and Wallsend Union Gas Company left the Commons Committee, there is every likelihood of the Newcastle Corporation appearing again in opposition to the measure in the House of Lords. Their interest in the matter, as has already been explained, rests in the fact that the Walker Company's works stand on land held under four leases from the Corporation, and which leases would, in the ordinary course of things, expire in 1936, 1938, and 1951 respectively. The Company now seek to purchase compulsorily the land comprised in these leases, together with an additional 4½ acres adjoining the works in Walker. They also ask for authority to make a railway from the gas-works to the Riverside branch of the North-Eastern Railway, partly upon the land to be compulsorily taken from the Corporation. If the Corporation appear in opposition before the Lords, they will contend that the establishment of these works at Walker will seriously damage the adjoining property of the Corporation, and suggest that there is other land in Walker near to that sold to the Newcastle Gas Company, which is suitable for the purposes of the Walker Company, and is in a position in which "the nuisance" arising from the manufacture of gas will not affect residential property. The railway and one or two other proposals in the measure will, in the view of the Corporation, also seriously interfere with their property. For these various reasons, the Walker Company may expect to meet Newcastle for another round at Westminster this session.

An Electricity and Mond Gas Bill. A measure of large magnitude, and which comes in conflict with numerous interests, is that known as the North-Western Electricity and Power Gas Bill. It runs on a line with the South Staffordshire Power-Gas Act, but its body is more corpulent than its predecessor by the inclusion of electricity supply. The proposed capital of the concern which the Bill is intended to bring into being is £1,500,000, with £500,000 borrowing powers; and the modest area of operations extends over Cheshire, Flintshire, Denbighshire, and parts of Derbyshire and Staffordshire—in all some 2000 square miles. The Committee of the Upper House whose onerous and unenviable duty it is to inquire into the measure have as Chairman Lord Glanusk; and they commenced their work on it last Thursday afternoon. The crowded state of the room in which the investigation is proceeding may be imagined when it is mentioned that there were originally no less than 49 petitions presented against the Bill; and though in some cases opposition has been reserved or settled, the remainder constitutes a very compact body of objectors—among them being electricity and gas supplying authorities, whose departmental engineers are in attendance to render assistance to the legal gentlemen entrusted with the defence of local interests. Several of the authorities are asking to be excluded from the ambit of the measure; but seeing that in the Somerset Electric Power Bill, which preceded this one, the same Committee refused exemption to Bath and Bristol, the chances of success here do not appear altogether promising. In opening, Mr. Balfour Browne, K.C., advanced the proposition that whenever corporations become traders, they become subject to the competition of traders; but to that, in connection with such supplies as gas and electricity, few readers will be found willing to subscribe. There is a provision in the Bill that the Company shall not enter into competition with any local authority or company established for purely lighting purposes; but they will not, if the Bill passes, be able to refuse to supply manufacturers, who will, of course, be in a position to do as they like with the electricity or gas purchased from the Company. Again, the Company cannot supply in any area which now forms part of the district of supply of any authorized distributors without consent, which, however, is not to be unreasonably withheld. Any question on this point is to be determined by the Board of Trade. This all looks plausible and fair and square. But there are many loop-holes for the escape of competition; and the opposing authorities supplying gas and electricity are making a good fight to obtain the exemption of their areas from the operations of the Bill. Evidence for the promoters was still proceeding when the Committee rose on Friday—the principal witnesses up till then having been Mr. Herbert A. Humphreys (whose name has been very prominently linked with Mond gas), Mr. H. E. Jones, and Mr. Ferranti.

Electric Power, Lighting, and Electrolysis. Mention has been made in the preceding paragraph of the Somerset Electric Power Bill; and there are two points on which protection was accorded by their Lordships to petitioners against the measure, which points are important, and may serve a useful purpose hereafter as precedents. The promoters contended that it was not their intention to compete with the local suppliers of electricity for lighting; but clause 42 of the Bill provided that the current supplied to any person for power purposes could be utilized for lighting his premises. Now, in the eyes of the Committee, this involved a difficulty, as electrical power might be used by a consumer for some small purpose—such as turning a knife-cleaning machine—and the rest of the supply, which might be large, could be utilized for lighting purposes. They therefore considered that existing suppliers of electricity should be protected from this, and that there should be some limitation named in the Bill. The Committee would not suggest what this limitation should be; but, in their opinion, the energy used for motive power should be in excess of that employed for lighting. Their Lordships also decreed that a clause should be inserted protecting the Bristol and West Gloucestershire Water Companies *from loss or damage* which might occur to their mains from fusion or electrolytic action. (For the Bristol Company, Mr. Balfour Browne, K.C., appeared, and for the West Gloucestershire Company, Mr. Ram, K.C.) Subject to these considerations, the Committee passed the preamble of the Bill. These are two points well worth remembering.

Oldham Water. Great opposition has been offered to the Bill of the Oldham Corporation, which is to confer power upon them to purchase the undertaking of the Deanhead Reservoir Commissioners, and to construct additional works; the estimated cost being £305,000. The proposals of the measure have aroused in opposition owners and occupiers of mills on the Colne, the West Riding County Council, the London and North-Western Railway Company, the Huddersfield Corporation, the West Riding Rivers Board, and the Greetland District Council. Such an antagonistic force must have caused Lord Clifford of Chudleigh and the other noble members of the Upper House who were engaged in dealing with the measure last week a great deal of embarrassment. These new works, it transpired, are mainly intended for the supply of outside districts, including Chadderton, Crompton, Royton, Failsworth, and Springhead; and, in fact, although every economy has been exercised, the Corporation are now compelled to come for a further supply. It is estimated that the Corporation will get from the new works in dry seasons about 1,400,000 gallons per day; but another decade it is predicted will find the Corporation in a serious position again. The authorities opposing were described during the proceedings as having simply adopted "a dog-in-the-manger policy" in connection with the Bill. A large number of local witnesses were called to prove the necessity to Oldham of the proposed powers. The evidence of the Rivers Board was to the effect that the scheme would take 500 million gallons of pure water out of the Black Brook and the Calder; and this would be a great hardship. The Huddersfield Corporation alleged that the proposed works would have the effect of intercepting water in springs from which they at present derive a considerable portion of their supply, and that, if they find it necessary to go for a further supply, the area Oldham now desires to annex is the only available one for them. The Greetland Council contend that the people in the valley ought to have first claim on the water proposed to be taken. The evidence proceeded very much on these lines. The Oldham Corporation Water Engineer (Mr. C. J. Batley) and Mr. Henry Rofe were among the witnesses for the promoters. The proceedings continued from Tuesday to Friday; and even then the evidence for the opposition had not been completed.

Changing a Water Scheme. In 1899, the Scunthorpe District Council obtained parliamentary sanction to the construction of new water-works; but the source of the supply has been found unsuitable and a better one has been discovered outside the district. Therefore the Council promoted a Bill this session to enable them to discard the old scheme in favour of the new. The Bill came, on Tuesday morning, before the Committee presided over by Lord Clifford of Chudleigh; and it was apparent that there was much of local interest in it. It appeared that the contemplated new works will be in the parish of Roxby-cum-Risby; and they include a pumping-station. Borrowing powers to the extent of £25,000 which already exist, it is intended to devote to the new undertaking. There was opposition from several quarters; and an effort was made to get the Bill thrown out "in the public interest." The Committee, however, were of opinion that "the public interest" could best be served by declaring the preamble of the Bill proved. They, however, gave protection and a free supply of water for domestic use to one of the private opponents; but they declined to insert a clause restricting the powers of the promoters in regard to outside supply. It is clear that the view of Parliament is that the obtaining of water by small communities should and shall be lightened as far as possible. Among the witnesses for the promoters was Mr. E. H. Stevenson.

HOUSE OF COMMONS COMMITTEE.

Wednesday, May 6.

(*Before Sir* JOHN BRUNNER, *Chairman, Mr.* CHAPMAN, *Mr.* PRIESTLEY, *and Mr.* JAMES HEATH.)

CRYSTAL PALACE DISTRICT GAS BILL.

This was a Bill promoted by the Crystal Palace District Gas Company, for the purpose of conferring further powers on them with respect to the purchase and holding of lands, to alter the provisions of the Company's Acts with respect to the illuminating power and testing of the gas supplied by them, to change the name of the Company, and for other purposes.

Mr. BALFOUR BROWNE, K.C., Lord ROBERT CECIL, K.C., and Mr. ROSTRON appeared for the promoters. The opponents were represented as follows: London County Council, by Mr. FREEMAN, K.C., and Mr. ADKINS; Borough of Lewisham and the Leathersellers' Company, by Mr. COURTHOPE-MUNROE; Beckenham Urban District Council, by Mr. WEDDERBURN, K.C.

Mr. BALFOUR BROWNE, in opening the case for the promoters, explained that the Company were incorporated by an Act of Parliament in 1858, and were authorized to supply with gas certain parishes and parts of parishes now in the counties of London, Surrey, and Kent, forming a district in the neighbourhood of the Crystal Palace. He submitted that the demand for gas in the district had increased, and was still increasing, and that it was expedient that the Company should

be empowered to purchase and use certain lands at Lower Sydenham for the development of their undertaking. They sought to extinguish a right-of-way which the Leathersellers Company had or claimed to have across the site of the Company's gas-works at Bell Green to the Mid-Kent line of the South Eastern Railway, which right-of-way was a cause of inconvenience to the Gas Company. In the Act of 1858, the illuminating power of the Company's gas was 22 candles; in 1873, it was reduced to 14; and in 1893 it was raised to 15, at which it now stood. Since that time, circumstances had entirely altered with reference to the supply and illuminating power of gas. When cannel coal could be got, it was mixed with ordinary coal in the retorts, and they obtained a perfectly homogeneous gas. Cannel coal had now become scarce. In 1889-90, from 3 to 3½ per cent. of the coal was used to enrich 1000 cubic feet of gas. The method now adopted was to force into the coal gas hydrocarbons giving the illuminating power which was got from mineral oils and gas tar. Having described the modern methods of enrichment in detail, Counsel dealt with the objections to carburetted water gas, and went on to say that 50 per cent. of their gas was now supplied for cooking, 15 per cent. for incandescent burners, and only 35 per cent. was being used in flat-flame burners. For cooking and incandescent burners, the illuminating power was of no use; and it was only the 35 per cent. on which the question of the illuminating power depended. Illumination really depended entirely on the burner used. With the Welsbach burner, they could get a similar illuminating power out of 8 or 10 candle power gas as they could get out of 25-candle gas. The Welsbach burners used to cost 3s. 6d. in England, and 1s. in Germany; and the ordinary mantle used to cost from 1s. to 1s. 3d. in England, and 2d. in Germany. Recently, however, in England the price of mantles had been brought down to from 4½d. to 6d.; so that they were within the reach of almost the poorest consumer. The question of cheap gas was becoming more and more important; and the Company were proposing to reduce the illuminating power and also the price of their gas. He hoped to show the Committee that to do this would be of greater benefit to the community than to the Company. He pointed out that in 1900 the South Metropolitan Gas Company obtained leave from Parliament, upon similar grounds, to reduce their illuminating power from 16 to 14 candles, allowing 1d. per candle per 1000 cubic feet to the consumer. In 1901, The Commercial Gas Company obtained a similar power of reduction, and also reduced the price of gas to the consumer. Only last session the West Ham Corporation came for a Bill; and though it was largely opposed, none of the opponents disputed the advantage of reducing the illuminating power, and the Bill passed. The London County Council opposed the South Metropolitan Bill in 1900, and the Commercial Bill in 1901. But this year the Council had promoted a Bill themselves to force the Gaslight and Coke Company to reduce their illuminating power from 16 to 14 candles; and they did so on really sound grounds, for they had been wrong in the first two cases. The Council had seen reason to change their mind. No doubt the reduction in illuminating power was a proper thing. The County Council were opposing the present Bill; but he did not think the Committee would hear anything about reduction of illuminating power. The Bill proposed to enable the Company to reduce the illuminating power from 15 candles (at which it stood now under the Act of 1893) to 13 candles. The Company were going to reduce the price of gas. They did not propose to make any profit out of the saving they were effecting. For every 1d. above 3s. 2d. per 1000 cubic feet the price was raised, the dividend fell 2s. 6d. For every penny below 2s. 10d. the price was reduced, the dividend was raised 2s. 6d. There was therefore a neutral zone between 3s. 2d. and 2s. 10d., from which no one got any benefit at all. What they proposed was that the top price instead of being 3s. 2d. should be 3s., and that at the lower part of the zone the figure should be 2s. 9d. instead of 2s. 10d. In the one case there would be a reduction of 2d., and in the other of 1d. That, in the view of the Company, was a fair and liberal allowance to make to the consumer. With other cheap illuminants in the market, the Company were anxious to reduce the price of gas; and the reduction proposed would do no harm to the consumer—the small loss in light was compensated for in the reduction in price. Much, of course, depended upon the burner used. An ordinary consumer might get the full illuminating power out of 13-candle gas; and for that purpose the Company would supply, free, the best burner obtainable.

The CHAIRMAN: Broadly speaking, you give a burner of the highest quality that will recoup the consumer for any loss?

Mr. BALFOUR BROWNE said he would be recouped three times over—the working would be conducted with greater economy, there would be a reduction in price, and there would be the gift of the burner. The next point was the method of testing contained in part 4 of the Bill. Long ago the testing was done by the bar photometer—a light being at one end of the bar and the standard light at the other, with a disc between. Upon the shining of the light through the disc was the quality of the gas decided. More recently, the table photometer had been introduced—the light of a pentane 10-candle lamp being thrown down on a screen at the bottom. In this case, the light of an argand burner was compared with the light of the lamp. Counsel explained the *modus operandi*, and gave reasons for Sugg's No. 1 argand burner being considered well adapted for testing purposes. It was proposed by the provisions in the Bill to leave the distance as it was, and send through sufficient gas to show 16-candle power, and from that to calculate the real power of the gas. This could be much more clearly explained if witnessed.

The CHAIRMAN remarked that he thought Parliament was waking up to the idea that, instead of enforcing rigid rules for this purpose, it would be well that the best available apparatus should be used from time to time.

Mr. BALFOUR BROWNE said the question was fought out a year or two ago; and it appeared that, though in a properly constructed room the table photometer was perfectly satisfactory, it was a question whether the peripatetic photometer was reliable. The Sugg argand burner was suitable, and was therefore suggested.

The CHAIRMAN asked how the quality of gas would be ascertained.

Mr. BALFOUR BROWNE said it would be done by means of a gas meter and a clock showing how much gas went through in a certain time. There was no difficulty in making the calculation. The South Metropolitan Gas Company got their clause in 1890; the West Ham Company in 1902.

The CHAIRMAN: You ask for a similar clause?

Mr. BALFOUR BROWNE said they asked for a clause in the same form as that in the West Ham Act; and he quoted the words in the Bill. They wished to put themselves in the same position as other Gas Companies—indeed, they were working under these conditions at Lewisham and other places where gas was tested. From a long list showing differences in testing, he took, as illustration, an instance of 14-candle gas tested in a 16-candle argand burner; and compared with other methods, there was a difference of 18 per cent.—a serious thing against a gas company. He quoted from the Gas Act of 1868 provisions now repealed which showed the principle upon which these things were controlled. He turned next to the question of sulphur compounds. Of course, in the preparation of gas, certain impurities were produced which the object of good gas making was to remove. These included ammonia, carbonic acid gas, sulphuretted hydrogen, and certain sulphur compounds. Some of these, though not required by law to do so, gas companies removed; sulphuretted hydrogen being the only one the law required to be removed. It was a colourless gas, with a distinctly disagreeable odour. It had become usual to insist on its removal; nor was there any particular difficulty in the removal. The original method of getting rid of sulphuretted hydrogen was to pass the gas over lime; but after a time it was found that oxide of iron removed the sulphuretted hydrogen more satisfactorily. The only other things gas companies had to remove were the sulphur compounds; and the obligation to do this was imposed in only sixty of all the Gas Acts. In the Crystal Palace Company's Act, the limitation was 22 grains in 100 cubic feet. The removal of sulphur compounds was a difficult matter. The use of lime had to be resorted to, and the foul lime was very offensive matter; its fumes were a nuisance in the neighbourhood of gas-works. From the Crystal Palace Company's works, 6500 tons were carted away annually. It was an offensive and expensive process; and he argued that, considering sulphur compounds did no harm in the gas, and that the saving in manufacture would go in the proportion of seven-eighths to the consumer, they might be released from an obligation to which only 10 per cent. of the gas companies in the country were subject. Only three local authorities were so restricted in regard to sulphur compounds; and in two of these the test was not applied. The test for sulphur compounds was not applied in America or on the Continent. This Company wished to be relieved from the restriction in regard to sulphur compounds put upon them in 1887, and from which they were partly relieved in 1893. These were the main features of the Bill. The testing clauses were proposed by the Commercial Gas Company; and though the County Council at first opposed, they afterwards came to an arrangement. He was therefore surprised to find the Council opposing the present Bill. Many of the matters were highly technical and he left them to be dealt with by witnesses.

Sir George Livesey was then called, and examined by Mr. ROSTRON. Before going into details, as Chairman of the Company, he explained that the interests of the Company and consumers were identical under the operation of the sliding scale, the decrease in price being a condition of a rise in dividend. The effect was to make the Company and consumers partners in the economy of manufacture. The consumers got £5170 by a penny reduction, and the Company divided an additional £719—the consumer getting seven-eighths and the Company one-eighth. This identity of interest was further strengthened by the auction clauses for the distribution of new capital; the object being to raise as little capital as possible. Fierce competition in lighting had altered the circumstances that prevailed when early restrictive legislation was passed; and it was in the public interest that needless restrictions upon manufacture should be removed. If the Company did not satisfy its consumers, they were free to go elsewhere for their lighting mediums. The present standard was 15 candles, to which it was increased from 14 in 1893. The Company found with their present coal supply that this could not be maintained without enrichment. This was a simple matter with cannel coal; but cannel becoming scarce, recourse had to be had to petroleum spirit by an expensive and unscientific method. He was an advocate for pure coal gas, because all enrichments carried with their use an uncertainty in the mixing, and 13-candle power gas could be secured by pure coal gas, and a wider market for coal would be opened. Having regard to changes in the use of gas, 13-candle power would be suitable for the general body of consumers. It was possible for a consumer receiving 13-candle gas to reduce it to 10-candle power by the use of an unsuitable burner—the consumer, in fact, could make the power what he liked. The Company had supplied hundreds of thousands of burners, with the result that the consumption of gas had been reduced. Part of the reduction was no doubt due to the use of incandescent mantles. As a matter of fact, with a reduction of the standard to 13 candles, consumers would get the same light. About a third of the consumption was for heating and cooking. He estimated the saving would be about ½d. per candle per 1000 cubic feet—something like £5000. Consumers would get seven-eighths of the reduction in the cost of production.

The CHAIRMAN interposed with an inquiry as to the objections of petitioners.

Mr. FREEMAN, for the London County Council, said his objection was to the reduction to 13-candle power from 15-candle. He questioned whether the reduction in the standard price was reasonable; and he objected to the proposed alteration in the method of testing, and the abolition of the provisions against impurity. Other points arose in relation to clauses.

Mr. WEDDERBURN entertained similar objections, as representing the Beckenham Urban District Council.

Mr. COURTHOPE MUNRO, for Lewisham, expressed the view that reduction from 2s. 10d. to 2s. 9d. was insufficient—it should be nearer 2s. 6d.—and that the testing proposals were wrong.

Witness resumed his evidence, much of which was confirmatory of Counsel's opening statement. By reference to past Acts, he showed

TABLE *showing Results of Testing for Sulphur Compounds at the Hill Street, Peckham, Station.*

Year.	First Quarter.			Second Quarter.			Third Quarter.			Fourth Quarter.			Whole Year.		
	Max. Day.	Min. Day.	Average.	Max. Day.	Min. Day.	Average.	Max. Day.	Min. Day.	Average.	Max. Day.	Min. Day.	Average.	Max. Day.	Min. Day.	Average.
	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.
1870	..	..	..	..	..	..	42·2	29·4	34·4	39·3	27·6	32·2	42·2	27·6	33·3
1871	39·0	28·6	33·2	35·4	20·5	29·3	35·8	22·2	30·1	39·4	29·6	35·2	39·4	20·5	31·9
1872	37·5	25·6	31·4	44·3	24·9	36·1	42·6	26·0	33·3	39·6	28·3	33·7	44·3	24·9	33·6
1873	41·4	29·0	36·1	39·9	23·8	33·2	..	..	..	..	..	..	41·4	23·8	34·6

that in the provisions for testing inserted in the Bill the principle for testing laid down by Parliament had been followed. The argand burner 30 years ago was the best in use. He described (with specimens) the effect of the size of the aperture in regulating the quantity of air, and gave reasons against multiplying standards—showing how the 16-candle burner could be adapted to 13-candle gas. The matter was complicated to all but experts; but he was satisfied that with the London standard burner a fair calculation of consumption would be arrived at. The "London" argand burner was used with a 16 candle flame for testing 15-candle gas at the present moment. With regard to sulphur compounds, the Company desired to come under the general provisions of the Gas-Works Clauses Act, which said that the gas was to be purified entirely from sulphuretted hydrogen, but did not put them under further restriction as to sulphur compounds. Prior to 1860, gas was not tested at all. Previous to 1850, no purifying agent but lime was known. The foul lime was extremely offensive; and it was this which had given gas-works their bad name. In 1850, oxide of iron became known as a purifier; and by its aid gas undertakings thought they got rid of all impurities. The late Dr. Letheby had, however, discovered that there were still sulphur compounds left in the gas, though it had never been shown that these were injurious to health. But a fuss was made about it; and in 1860 Parliament decided that gas should not contain more than 20 grains of sulphur compounds in 100 cubic feet. It was found that nothing but lime would eliminate the sulphur compounds. The Act of 1860 became a dead-letter. [Witness put in a table, summarized above, showing the results of official testings for sulphur compounds taken at the official testing-station, Hill Street, Peckham, from July 6, 1870, to June 30, 1873, before any restrictions were imposed. These tests showed the total amount of sulphur compounds in gas made from Newcastle coal with simple oxide of iron purification; no lime at all being used.] In 1868, the London Gas Referees were appointed, not only to prescribe the burner, but to say to what extent gas was to be purified from sulphur compounds. In that year, however, the difficulty of fixing the limit as to the compounds was so great that nothing was prescribed.

The CHAIRMAN: This proposal of yours, if adopted, would leave you at liberty to use coal that was inferior, so far as regards the quantity of sulphur compounds contained.

Witness said they might be at liberty to use inferior coal, but they would not do so. It would have impurities which would be objectionable on other grounds. If there was too much sulphur left in the gas, the consumers would taste it, and would cease to use gas. Of course, if the proposal of the Company were adopted, they would still have to purify the gas from sulphuretted hydrogen. The testings made in London in 1870 and 1873 showed that there had never been more than 44 grains of sulphur compounds per 100 cubic feet in the gas on any one day. If purified by oxide of iron alone, there would never be more than 34 grains per 100 cubic feet in the Crystal Palace Company's gas in one day. At present, they were limited to 30 grains in one day, or 22 grains per day on an average of six days. To get rid of the prescribed quantity, the Company had to use lime; oxide only being used as a stray catcher to eliminate any sulphuretted hydrogen that might be left. He had had numerous complaints of the nuisance caused by this use of lime, and this was one of the main reasons for the Bill. The Company had been summoned twice by the Lewisham Local Authority; and though they had made the best case they could, they had been obliged to admit the nuisance. The Magistrate said he was satisfied they were doing the best they could to minimize the nuisance; therefore he could not convict. The use of lime was decidedly objectionable, and was unnecessary, as he was satisfied that the oxide eliminated all the injurious properties from the gas.

The CHAIRMAN asked whether libraries would not be injured by the sulphur compounds left in the gas?

Witness said they would not be injured. Besides, ordinarily the owners of libraries would use electricity. He would give the Committee facts as to the practice in other places.

[Witness here put in a statement giving a list of gas undertakings within the United Kingdom authorized by Act of Parliament or Provisional Order from 1860 to the end of 1902 with a summary of the total number of gas undertakings under Acts of Parliament since 1860, when sulphur clauses were first introduced. This table will be found summarized in "Gleanings from the Committee Rooms."]

In cross-examination by Mr. FREEMAN, witness said the Crystal Palace Company did not come within the reference of the Board of Trade Departmental Committee on gas testing, which had relation to the London Gas Companies. His opinion was that the Committee was agreed to for the purpose of relieving the County Council from a false position into which they had got themselves. The regulations for London applied to the three Companies. Only a part of the Crystal Palace Company's area of supply was within the London district; and the consumers there did not number half of the whole. He wished to have the Bill considered on its merits, and would not be content that legislation for the three London Gas Companies should be applied to the Crystal Palace Company. The Company, with the Brentford and Wandsworth Companies, did not come under the London regulations; and upon these the County Council had never been able to impose the conditions they desired. The standard of the Company from 1873 to 1893 was 14 candles; and in the latter year it was raised to 15 candles. On that occasion, the County Council took part in the discussion; and the rise took place mainly at the instigation of Beckenham. The South Metropolitan Company in 1900, and the Commercial Company in 1902, were authorized to reduce their gas from 16 to 14 candles; and 14 candles was the lowest standard in the Metropolis, but not throughout the country. Experience had shown 14 candles to be too high—it could hardly be got out of the coal; and 14 candles was a tentative step. He said then, and now repeated, that ultimately the power must be reduced. If they could get 8 or 9 candle gas with sufficient heating power, it would be useful for lighting purposes; but they could not get it. The power might be reduced step by step below the present proposal; there was no finality in the move now being made. Water gas he did not like, and would be glad to abolish the use of it; but this could not be done until the quality of the gas supplied was reduced. The standard price was fixed in 1893 at 2s. 10d. per 1000 cubic feet for the lower and 3s. 2d. for the upper margin. The present price was 2s. 7d.; and he hoped it would never touch 3s. 2d. It was, however, up to 2s. 10d. a few years ago. One candle would represent 1d. He did not remember that in 1893 he said it represented 1¾d.; but the circumstances in reference to enrichment had changed. About that time, petroleum spirit was coming into use. They worked for the benefit of the consumers; and if they did not, their business would suffer. The first consideration with consumers was cheap gas, not illuminating power. The difference between 13, 14, and 15 candle gas was not appreciated by the consumer; much depended on the burner used. The Company would supply the consumer with a burner suitable for 13-candle gas, which would give the best possible result, and would supply Welsbach mantles at cost price. They would charge a small fee for inspection of mantles, if desired to undertake the duty; but he would prefer not to have these matters made statutory obligations in the Bill. The provision as to testing was the West Ham clause. Pressed by Mr. Freeman, witness said he would be willing to yield the point, and insert the words of the South Metropolitan clause. Notice in writing of intention to test was for the purpose of securing that a representative of the Company should be present. He admitted that long notice would afford opportunity for special enrichment; but he wished to abolish the enrichment apparatus, as the South Metropolitan Company had done. Gas of 13-candle power would be obtained without enrichment. The lowest they could make from Newcastle coal was 12-candle gas. He repeated his reasons for not altering the 16-candle burner test. A flat flame burner would not do for testing; and he did not wish for variations in standards. The abolition of the test for impurity would cheapen production; and the benefit of the saving would, to the extent of seven-eighths, go to the consumer. The saving would be about ½d. per 1000 cubic feet, and possibly a little more. There was also the prevention of much worry. As the saving might be qualified by other circumstances, he could not agree to insert a provision making reduction a condition of the abolition of the purity test.

Witness was further questioned by Mr. WEDDERBURN, in reference to the purifying provisions, and said they were made matter of agreement in 1893; but the conditions had proved intolerable. He did not believe that any gas-making coal produced more than 40 grains of sulphur compounds.

Mr. WEDDERBURN, in the course of his cross-examination on this matter, was interrupted by

The CHAIRMAN, who said it would be difficult to persuade the Committee that, with the many instances in which gas was supplied without this restriction, the removal would really be any great hardship to Beckenham.

Mr. WEDDERBURN replied that others had not an agreement, but Beckenham had; and he pressed Sir G. Livesey to give an extra 1d. reduction on condition of giving up the agreement. This, however, he declined to do.

In the course of a short cross-examination by Mr. COURTHOPE MUNROE (who appeared for the Lewisham Council), witness undertook to make arrangements to meet the objections of the Council by widening Southend Lane where land was taken, and covering in the Ravensbourne water. He also agreed to arrange terms with the Leathersellers Company for stopping the right-of-way claimed by the latter.

Thursday, May 7.

Sir *George Livesey* was re-examined by Lord R. CECIL, and stated that he had looked into the statistics bearing upon the abolition of the use of lime for the removal of sulphur compounds and the substitution of oxide of iron. He found that the Bromley Gas Company incurred from the use of oxide in the years 1897-8-9 an average expense of ¾d. per 1000 cubic feet. The following year there was some difference of opinion; but, roughly speaking, there would be by the abolition a saving of ¾d. Whatever saving there might be, the Company would be happy to give to the consumers, and would get their small proportion.

The CHAIRMAN asked whether they would be ready with a form of words to secure this advantage to consumers.

Witness said the ordinary operation of the sliding-scale would give it; no alteration of the Act would be necessary. With regard to the illuminating power, they would give a penny off the price of gas, and the public would get a good deal more by this saving. They could not get less than seven-eighths of the saving. The Company

would get so little that there was hardly any inducement to reduce the price; the real inducement was to keep their business. The Board of Trade had agreed to appoint a Departmental Committee to inquire into the question of gas testing. But the Committee had not yet been appointed; and their report might not be forthcoming for two years. The report could only affect the three London Companies; and then only as they came to Parliament for further powers, unless there should be an agreed Bill introduced by the Board of Trade.

The CHAIRMAN asked if there would be any objection to agreeing that the Crystal Palace Company should come under the rules.

Witness said he was afraid he could not agree to that. It would be the first step towards coming under the domination of the London County Council; and he had had enough experience of their tender mercies to decline such a position. These regulations for London were instituted in 1869, and had never been extended beyond the three Companies he had mentioned. The Wandsworth Company were in exactly the same position as the Crystal Palace Company. The London County Council attacked them in 1900, and suggested their coming under the same conditions as the three London Companies; but Parliament refused to apply the conditions to this small Company. The feeling was so strong with his own Company that they could not be induced to come under the County Council, whose persecuting manner was such that the Company would rather never come to Parliament again for further powers than submit to that body.

The CHAIRMAN asked why, if the Company agreed to come under the Board of Trade rules, that would bring them under the Council.

Witness said it would be a step towards it; and he went on to give an instance of the character of the Council's intervention in their habit of making Sunday tests when work was practically stopped, and though, subject to the desire to give their men a rest, the Company endeavoured to keep up the quality of the gas, a drop of a hundredth part below the standard would render them liable to penalty. They could make 14-candle gas with good Newcastle coal; but beyond that the use of Londonderry or Durham coal made the gas more expensive. The South Metropolitan Act came into operation in 1901; and upon experience since then he made that statement. The test burner had always been the London argand; and the table photometer was arranged for the use of gas in these burners. The argand was the best burner for ordinary gas, and they took that as their charter. If they had a flat-flame burner, a number of experiments would be required extending over a long period. It would be introducing a new standard; and the wiser course would be to adhere to the 16-candle argand. Illuminating power and sulphur went together; but the coal he had in mind for use was not worse as to sulphur.

Mr. *S. Y. Shoubridge* confirmed the statements made as to land being required for storage and workmen's quarters. In reference to sulphur compounds, he generally confirmed Sir George Livesey's evidence. The nuisance caused by the use of lime for the removal of these compounds was considerable. In the course of the year, the Company had to dispose of 6500 tons of the foul lime, principally in the neighbourhood, for filling up holes that could be found—such as disused gravel pits. Quite recently in one part of the district water percolating through this lime polluted a stream, and caused the intervention of the local authority. Formerly it was disposed of inside the works; but water getting through the lime, the result was heavy payment for damages caused outside. The extra 15 grains at issue made practically no difference to anybody. He had had 13 years' experience in the large works of the Birmingham Corporation. There they did not take out the sulphur compounds, and there were no complaints from consumers. Subsequently, he spent ten years at Salford, and had a similar experience—there were no complaints. He confirmed Sir George Livesey's evidence as to the cost of the purification process. From an analysis of the records over 11 years, he found the average cost was 0·83d. per 1000 cubic feet. Where only oxide of iron was used, the cost was 0·56d. He put in tables showing the heating value of different qualities of mixed gases, the mixture being about 22 per cent. of carburetted water gas and 78 per cent. of coal gas. The result of experiments showed the efficiency obtained from an incandescent mantle with gases of different illuminating values, and particulars as to tests made by the official gas examiners for Lewisham and Beckenham during 1901 and 1902.

Heating Value Tests of Different Qualities of Mixed Gases.

[Mixture about 22 per cent. C.W.G. and 78 per cent. of coal gas.]

Date, 1903.	Ill. Pow. Table Photometer. Referees' Test.		Heating Value. B.T.U. Net.	
Feb. 12	15·32	Cand.	546·2	
,, 19	15·30	,,	553·4	
March 4	15·23	,,	556·2	
Feb. 18	15·20	,,	543·9	
,, 14	15·19	,,	546·6	
March 14	15·18	,,	535·5	Mean Ill. Power. 15·13 candles. B. T. U. 545·7 net.
Feb. 16	15·17	,,	541·9	
March 7	15·10	,,	553·0	
,, 4	15·10	,,	541·1	
Feb. 26	15·09	,,	536·8	
,, 17	15·08	,,	556·1	
,, 11	15·03	,,	546·6	
March 13	14·40	,,	551·8	
,, 20	14·34	,,	557·0	
,, 20	14·00	,,	533·4	
,, 14	13·85	,,	549·4	
,, 14	13·85	,,	550·2	
,, 12	13·73	,,	546·6	
,, 17	13·56	,,	538·0	Mean Ill. Power. 13·18 candles. B. T. U. 537·4 net.
,, 23	13·11	,,	534·7	
,, 24	13·27	,,	528·0	
,, 11	13·06	,,	550·2	
,, 18	12·85	,,	518·5	
,, 23	12·72	,,	546·2	
,, 17	12·52	,,	522·2	
,, 17	12·01	,,	552·2	
,, 23	11·83	,,	508·1	
,, 23	11·57	,,	504·6	
,, 12	11·50	,,	546·6	

Experiments showing the Efficiency obtained from an Incandescent Mantle with Gases of Different Illuminating Values.

[The mantle tests were made with a 60-inch Letheby bar photometer, using the Harcourt 10-candle lamp as the standard. The illuminating power of the gas was determined simultaneously with a table photometer. The same mantle was used throughout the tests. The burner and mantle used were Welsbach "C."]

Date, 1903.	Nature of Gas.	Illuminating Power by Table Photometer.	Total Illuminating Power by Mantle.	Rate of Consumption.	Efficiency per Cubic Foot.
		Candles.	Candles.	Cub. Ft.	Candles.
March 23	Coal gas,	11·57	65·00	3·375	19·26
,,	76 p. ct.;	11·83	66·00	3·400	19·41
,,	Carburetted	12·52	66·50	3·350	19·84
,,	water gas,	12·72	67·90	3·300	20·57
,, 22	24 p. ct.	12·75	70·00	3·500	20·00
,,	Coal gas	12·98	70·07	3·550	19·74
,,	,,	13·05	68·24	3·520	19·38
,, 23	Coal gas, 76;	13·11	68·25	3·325	20·52
,, 20	C. W. G.,	13·86	71·00	3·400	20·88
,,	24 p. ct.	14·00	66·00	3·250	20·03
,, 22	Coal gas	14·10	68·75	3·550	19·30
April 3		14·70	61·87	3·350	18·47*
,,	Coal gas,	14·89	66·40	3·350	19·70
,,	70·5 p. ct.;	15·06	69·00	3·350	20·91†
,,	C. W. G.,	15·42	63·90	3·350	19·01
,,	29·5 p. ct.	15·57	65·25	3·400	19 15
,,		15·96	64·60	3·400	19·00
				Average .	19·7

* Lowest. † Highest.

The general consumer used a burner which did not do justice to the gas; and the last thing people thought of was the removal of their gas-burners—they continued to use them long after they were worn out. If they used the burner supplied by the Company, they would get much better results than they had been accustomed to. A calorific standard would not work; it was better to use an illuminating test. There was a testing-station at the works, and another at the offices of the Beckenham Council—2800 yards from the works. The Lewisham tests were not very frequently applied at the works. There were only four during 1900. He had heard of no complaints that the existing testing-stations were insufficient. At the works, the examiners could test the whole of the gas going into the district. There was very slight difference indeed in the results of tests made at the works and at Beckenham.

In cross-examination by Mr. ADKINS, witness was unable to say the extent of the sulphur compounds at Salford and Birmingham.

The CHAIRMAN, interposing in the cross-examination on this point, said it might be worth while to say that the Committee were profoundly impressed by the fact that 90 per cent. of the companies supplying gas were not under any statutory restrictions with regard to sulphur compounds.

In further cross-examination, witness admitted that the tests he had made with what had been called adulterated gas were not absolute proof, though they were of value as indications.

In cross-examination by Mr. WEDDERBURN, witness would not admit the supposition that the saving by the reduction of illuminating power and the abolition of the purity clause gave consumers a fair claim to a reduction of 3d. in the price.

In reply to Mr. COURTHOPE MUNROE, witness said that it was not a matter of saving money to the Company; there was the saving of annoyance to the neighbourhood. He denied that there would be a loss of 20 per cent. in heating power by the reduction of 2 candles in the lighting power. He calculated that 36·6 per cent. of the gas supplied by the Company was used for heating, cooking, engines, and incandescent burners; the remainder being used in flat-flame burners.

The CHAIRMAN remarked that Mr. Balfour Browne had stated that the advantage of the new burner to be supplied would extend to two-thirds of the consumption.

Witness said it would.

The CHAIRMAN said they had it in evidence that a third of the gas was used for cooking and power.

Sir *George Livesey* said that was a mere guess on his part; he was not then thinking of the incandescent light. Every consumer would be offered the new burner; for even those who had the incandescent light might not have it in all their rooms.

Mr. *Shoubridge*, in re-examination, expressed his opinion that the only fair way in which to use the standard argand burner was to keep it as now and get a 16-candle flame; and it was so used at Beckenham to test the 15-candle gas. It was the custom of the Company to send round a man to keep mantles in order at a charge of 1d. per mantle per month. By the reduction of the illuminating power, there would be no loss in heat, because pure coal gas would be used. Part of Beckenham drew gas from the Bromley works, where lime was not used; and there were no complaints of the impurity of the gas.

Mr. *H. Hack*, Gas Engineer to the Birmingham Corporation, was proceeding in reply to questions from Mr. ROSTON to give his reasons for the opinion that the removal of sulphur compounds carried with it no benefit to the consumer comparable to the nuisance the removal caused, when

The CHAIRMAN repeated that the Committee were impressed by the fact that 90 per cent. of gas-makers were free from restriction, and suggested it was not worth while to go into this matter.

In the course of his evidence, witness said they employed lime in two of their works at Birmingham, but were about to abolish it and use oxide of iron only. The tests made showed a difference between 34 and 25 grains by the use of lime. As a matter of interest, and for information, tests were applied. He did not know that the consumer suffered any injury from the sulphur compounds in gas. He had heard that leather was affected; and, of course, proper ventilation was necessary. Correspondence in the newspapers drew attention to

this subject; and his Committee tried the lime process. After a time, a representation came from the Health Committee that the nuisance must be stopped; and the lime was not allowed to be dropped in Birmingham. It was sent to Dudley Port. So the Committee decided to abandon the lime and go back to oxide.

Professor *Vivian B. Lewes* said the introduction of incandescent mantles had made an enormous change in the circumstances of gas supply; and the tendency was for the use of this system to increase. There was, with this tendency, an increasing demand for gas for heating purposes. The advance of the use of incandescent mantles in this country had been hampered by the Welsbach monopoly; but with the cheapening and improvement of mantles, the use of them would extend rapidly. The employment of mantles was far more general on the Continent. In Berlin, 97 per cent. of the gas lighting was incandescent. For all practical purposes, a 13-candle gas was sufficient for lighting and heating. From a haphazard collection of burners in use, he found that consumers actually had a light equal to 8 or 10 candles. The consumer bought a cheap burner, and took the light he obtained—grumbling and blaming the Company, when the burner was in fault. With the coal now procurable, for high illuminating power enrichment would be necessary; but it was preferable to send out the gas as made from coal, without any enrichment. The method of testing prescribed in the Bill was, in his opinion, simple and fair. The 16-candle argand burner should be used, because it did justice to the gas. Of course, it would not be burned at the same rate; the 5-feet rate was only fitted for 16-candle gas. A flat-flame burner would not supply a satisfactory test. He agreed with the evidence given as to the public nuisance of the lime process in removing sulphur compounds, by reason of having to dispose of the foul lime, and that this was a far greater inconvenience than would be caused by the retention of a small amount of the compounds in the gas.

Dr. *Samuel Rideal* gave evidence in which, from inquiries he had made in Brussels, Berlin, Vienna, Paris, and elsewhere, he stated that the use of lime for eliminating sulphur compounds in gas was practically unknown on the Continent.

The CHAIRMAN intervened in the course of the examination, to again remind Counsel that 90 per cent. of the gas manufactured in this country was free from statutory regulations for the removal of sulphur compounds. Further, he desired to know why it was that gas of 8-candle power was largely used on the Continent, and could not be made here. He did not like to hear that foreign manufacturers could do what British manufacturers could not.

Witness said it could be made. It was a question of the illuminating power assigned to gas in this country. On the Continent, the object was not to get the highest illuminating power. He was not a gas engineer; but he should say that probably it was a question of having the necessary plant. Given the plant, it would be just as easy to make 8-candle gas here as elsewhere.

In cross-examination by Mr. ADKINS, witness explained that in some of the old contracts for the supply of gas on the Continent, the regulation as to sulphur compounds might be found; but it was not the custom to apply tests for these, and in later contracts the restriction was not renewed.

Mr. COURTHOPE-MUNRO said the outstanding question with the Leathersellers' Company as to right-of-way was in course of settlement.

With this evidence the case for the promoters closed.

Mr. FREEMAN said he would defer any observations he might feel it his duty to make until he had put his evidence before the Committee.

Mr. *Isaac Carr* was then called, and in the course of his evidence said that for years past gas of 18-candle power had been supplied in Widnes at a price lower than it was sold elsewhere; the present charge being 1s. 5d. per 1000 cubic feet to ordinary consumers, and 1s. 3d. for large consumers. Their statutory standard was 14 candles. He considered they consulted the interest of the customers in supplying gas of an incomparable quality. He gave the results of tests he had made by the method suggested in the Bill, and said he was led to the conclusion that a consumer, to obtain the same light after the reduction proposed, would have to pay 10d. more while he received a reduction of 2d. The so-called 13-candle gas would, according to the statutory method of testing, be 10¾ candles. The cost of enrichment was never so low as now. Lancashire cannel coal was not scarce; and there were cheap means of enrichment by petroleum and benzol. With reference to burners, he advised the use of a governor to regulate the light, especially in large establishments with many lights. It was a general practice in the Provinces to supply governor burners free to customers. With proper care, there was no difficulty in keeping within the limit of 20 grains of sulphur compounds. Though there were many instances in which there was no statutory limit for these impurities, it was very rare to find their importance disregarded. In the interest of consumers, purification was carried out. At Luton, for instance, though there was no statutory restriction, in the interest of the straw hat making trades it was deemed necessary to keep within the limit of 20 grains. Witness put in a table of tests he had made of calorific values of gases. Under conditions applicable to the ordinary consumer, he found, from tests, that by the suggested alterations in the Bill the consumer would get 18 per cent. less in heating value. By using oxide highly charged with free sulphur, and without the use of lime, the amount of sulphur compounds could be kept to the limit of 20 grains. It was the usual custom, whether there were restrictions or not, to apply tests and keep these compounds within reasonable limits.

Witness was cross-examined at length by Lord R. CECIL. He insisted that it was in the interest of consumers to keep the gas at a high illuminating power, if necessary using enrichment. He enriched with benzol, and never found that the benzol was dropped by the gas in passing through the mains. He made a distinction between cheap gas and cheap light; the latter being the object to secure. He declined to accept the theory that 13-candle gas was equal to 15-candle gas for the purposes required, and gave reasons why the test proposed in the Bill was an alteration in favour of the Company.

Mr. *C. R. Bellamy*, Gas Examiner to the Liverpool Corporation, said he had tested the gas by the method proposed, and found, as between the result and that shown by the standard test, a difference of 4½ candles. To obtain the same light under the change, a consumer would have to increase his gas bill by about one-third. The consumer using a flat-flame burner would find an increase by about 10d. per 1000 cubic feet. He held it to be an unwise policy to reduce the illuminating power; it should rather be increased beyond 15 candles. Liverpool gas was of 20-candle power; and with municipalities the tendency was to keep up rather than to lower the illuminating value. The proposal in the Bill to discard the restriction upon sulphur compounds he regarded as a retrogade step.

Friday, May 8.

The CHAIRMAN, on the resumption of the proceedings to-day, said he thought it well that parties should know what was in the mind of the Committee. In their opinion, all manufacturers of gas for the public should be free to take advantage of scientific improvements affecting their undertakings. To take an instance, there was the invention of the Welsbach burner—an enormous improvement in the use of gas. But the public would not get the benefit of this improvement unless manufacturers of gas had increased freedom. From this point, the Committee had come to the conclusion that the Counsel in opposition to the Bill should address themselves to the question of price at the upper and lower ends of the scale. He hoped that Counsel would accept this position. The Committee agreed that they were perfectly at liberty to offer evidence to elucidate the points in question; but they hoped this expression of opinion would have an effect on the proceedings.

Mr. BALFOUR BROWNE accepted this as an important decision.

Mr. ADKINS, however, said he did not quite understand the effect of it or the points of difference.

The CHAIRMAN remarked that the freedom they desired for the manufacturers of gas, of course, involved freedom to reduce the illuminating power. The Committee regarded it now entirely as a matter of price as between the manufacturers and the public—the amount or value to be given to the public.

Mr. COURTHOPE-MUNRO inquired if this went to the question of purification.

The CHAIRMAN replied that it did—any question involving the price the Company should charge.

Mr. BALFOUR BROWNE said the liberty allowed the Company would conduce to economy; and the saving would be shared in the ratio of seven-eighths to the consumers and one-eighth to the Company.

Mr. *Carr* was re-called, and declared that the initial price of gas in London was too high. He was able to provide gas of a higher illuminating power at half the price—to small consumers at 1s. 5d. per 1000 cubic feet, to large consumers at 1s. 3d., and for motive power at 1s. 1d., for gas of 18-candle power. Gas of 15 candles should be 20 or 30 per cent. less in price in London, putting aside all questions of dividends and sinking fund. He did not know that the cost of distribution was greater in London than in Widnes, though the latter had the advantage of proximity to coal-fields. But Plymouth, with sea-borne coal, had a gas supply at 1s. 9d. per 1000 cubic feet; and he could find no reason for the enormous difference in London.

In cross-examination by Mr. BALFOUR BROWNE, witness admitted that cost might depend on the amount of capital involved, the situation of gas-works, and the value of land. The figure he had given had nothing to do with administrative charges. He estimated the average cost of production in London at 1s. 2d. per 1000 cubic feet. The price obtained for coke was higher in London. He was sure that the passing of the Bill would be a great injustice to the consumers.

The CHAIRMAN remarked that the Committee might be trusted to do their best to prevent injustice.

Dr. *H. E. Armstrong* expressed his view from special experience in gas testing upon points where he considered the interests of consumers were not properly safeguarded in the Bill. With regard to sulphur compounds, the Gas Referees and the London Companies had been examples to manufacturers for a long time to do their best for the purification of gas; and the withdrawal of the example must have a bad effect throughout the country. Coal gas, of course, must be considered more or less a nuisance at all times; but that sulphur compounds increased the nuisance was obvious from the effect on plants, pictures, and other things. Purification he held to be essential. As 66 per cent. of the gas was used in flat-flame burners, there would be an enormous loss to the consumers by the change in power. The great majority of consumers did not use incandescent burners; the mantles were too fragile and too difficult of adjustment for ordinary use. The sending round of a man to look after mantles was expensive and troublesome; and the Welsbach light, though a valuable discovery, would not come into common use. He then questioned Sir George Livesey's views as to the advantage of using coal gas entirely, and contended that carburetted gas could be employed with perfect satisfaction. With the change proposed in the Bill, he estimated that consumers would have to use 10 per cent. more gas to obtain an equal light to that they could get at present.

Mr. FREEMAN interposed here for the purpose of explaining his position. The Committee had made up their minds on two points—that the reduction to 13 candles and the dispensation with the limitation upon impurities, were proper things for the promoters to ask for. Inasmuch as both these matters went to the very root of the opposition, although he had a considerable number of eminent scientific witnesses whom he had proposed to call, he felt it would be impertinent and a waste of time if he continued an argument upon which the Committee had made up their minds. He felt it his duty to regretfully accept the statement of the views of the Committee; and, so far as the present Committee were concerned, he would not proceed any further.

The CHAIRMAN pointed out that the Committee were prepared to hear anything that could be urged on the question of price.

Mr. FREEMAN said this was inextricably connected with the other questions, and could not be considered apart from them. With every respect, he felt it would be useless to call further evidence; and he was authorized to say that his learned friend Mr. Wedderburn took the same view.

Mr. COURTHOPE MUNRO took up the same attitude, except that he desired to call evidence in support of paragraph 18 of the Lewisham petition, in favour of a separate testing-station there.

Mr. *Alfred Howard*, Gas Examiner for the Lewisham Council, then gave evidence in support of the proposal for a Lewisham station.

Mr. COURTHOPE MUNRO argued in favour of the claim, and offered a site at the Stone Yard, Forest Hill, free of rent, for the purpose; and to this Sir George Livesey ultimately consented.

Sir *George Livesey*, at the request of the Chairman returned to the witness-chair for the purpose of satisfying the Committee that the public would receive an equivalent under the Bill for the advantages the Company would derive from the reduction of the candle power and the removal of purity restrictions. He reiterated the facts and figures that led him to the opinion that it would be fair to let the sliding-scale operate in the ordinary way; and he finally said that, if the Company were allowed to reduce the illuminating power to 13 candles and were relieved of the sulphur compound restriction, he would give a pledge that immediately after the passing of the Act the selling price of gas should be reduced to the consumers by a penny, and another penny should be taken off at the end of six months. In any case, there would be an advantage to consumers of £10,000 at once. He objected to any further reduction of the initial price, because it would be used as a precedent to be enforced by the London County Council against other Companies. He referred to the experience of the South Metropolitan Company as showing that decrease in illuminating power did not involve increased consumption.

The preamble of the Bill was then declared proved; and after considerable discussion between Counsel for Lewisham and the promoters, the clauses were adjusted.

HOUSE OF LORDS COMMITTEE.

Monday, May 4.

(*Before Lord* NEWTON, *Chairman, the Earl of* ROMNEY, *Viscount* BARRINGTON, *Lord* SANDHURST, *and Lord* HYLTON.)

BIRMINGHAM CORPORATION BILL.

This was a Bill promoted by the Birmingham Corporation for, among other things, authority to construct gas-works on land already belonging to them at Erdington.

Mr. BALFOUR BROWNE, K.C., Mr. BLENNERHASSETT, K.C., and Mr. GERALD FITZGERALD appeared for the promoters. The petitioners were represented as follows: Ernest Welcome Richards, by Mr. CLEES; the Erdington Urban District Council, by Mr. C. C. HUTCHINSON and Mr. LAMBERT.

Mr. BALFOUR BROWNE, upon the conclusion of the portion of the Bill relating to tramways, said the next proposal was to take, for the purposes of the gas-works in Birmingham, a site which really already belonged to the Corporation, because they had purchased it. All they sought by the Bill was authority to construct gas-works on it. Just to the south of the site was a sewage farm, where all the sewage of an enormous area, including Birmingham—800,000 persons all told—was treated; so that it was not a very delectable district. The land was in every way adapted for the purpose of constructing gas-works. The present works of the Corporation were now practically exhausted. The increase of consumption of gas now was at the rate of 4½ per cent. compound per annum; so that there was no doubt that they should immediately begin to make provision for a further supply. The site of the new works was about 120 acres in extent. It would all be required; and no doubt the presence of the gas-works would do much good to the locality, because they would bring workmen's dwellings into the district, and thus increase the rateable value. The Erdington Council, in their petition, said the area of their district was 4550 acres, and that the population exceeded 17,000. They alleged that the district, and the health and interests of its inhabitants, would be injuriously affected by clause 130, which authorized the Corporation to borrow, "for the erection of gas-works at Erdington and for other gas-works purposes, the sum of £500,000." They said their district was "a residential suburb, which has been specially chosen as a place of residence on account of its amenity and healthiness." He was very glad to hear that the sewage farm was a healthy suburb. The petition went on to say: "A very large proportion of the residents own their own houses, and anything which would affect the amenities of Erdington would be a cause of serious loss to them, as they cannot easily remove to another district." He thought, however, all the wealthy residents had already removed, as was shown by the fact that the Corporation had purchased 108 acres of the site, with a house called "Glenthorne," for £15,000, which was very cheap; and also by the fact that Mr. Richards, the other petitioner, had purchased a house called the "Rookery," near the site, with land, greenhouses, &c., for £4000. No doubt some parts of the parish would not be suitable for gas-works; but this place was. Moreover, in one sense, a gas-works could not be a nuisance. If it was, unlike a railway or an electric light producing works, it became liable. Then the petitioners said:

> These gas-works may occupy the enormous area of 120 acres; and from their size, and the great expenditure proposed to be made upon them, your petitioners are apprehensive that they are intended to be made the principal gas-works to supply the city, and the city's area of supply. They will be so situated in close proximity to the residential part of Erdington that, especially with a southerly wind, the smell and other unpleasant features which inevitably accompany gas-works may have a most prejudicial effect upon the health and comfort of the inhabitants, and indeed completely alter the district.

He thought the Corporation would, however, be able to show that this was an overstatement of the case. The petitioners next alleged that the gas-works might cause the rates to increase, by preventing the continuance of the building of houses of good class, and leading to others already erected becoming vacant, and by increasing their sanitary obligations if small houses were built near the gas-works. In regard to this, Counsel pointed out that the vendor of the Corporation site had a perfect right before he sold to erect a manufactory there, and to build small cottages in the vicinity; and no one could have prevented him. Then, it was contended that there was no necessity to erect gas-works on the site, and that the Corporation, if there was any need to erect new gas-works rather than extend the present works (which the petitioners did not admit), could easily find a suitable site elsewhere. The Corporation, however, had exhausted their resources as regards sites; and it was only after careful inquiry that they fixed on this one. The Council further argued that the proposed works would be wasteful, and lead to an enormous increase in the price of gas, which would affect them as consumers of the Corporation gas for street lighting. The prices charged by the Corporation in the Council's district were already much higher than those charged in the city, and the Corporation made large profits at the expense of Erdington. The Committee would hear that the price charged the Council was precisely the same as in the city. He thought that unfair. If there was a loss, it must all fall on the city; and therefore it was fair to charge people outside a little more. Mr. Richards said he was the owner in fee of the Rookery, a residential estate of some 20 acres and valued at £20,000, which was within 300 yards of the site. He stated that two-thirds of the estate had been laid out for the purpose of a fruit and vegetable grower and nurseryman, at an expense of several thousands of pounds; and he alleged that his property and interests would be most injuriously affected by the proposal of the Bill. Counsel, in conclusion, said the Corporation would have to show the necessity for selecting this site, the gas-works on which would do no harm either to the District Council or to Mr. Richards; and therefore he would ask the Committee to allow the Bill to proceed.

Tuesday, May 5.

On the resumption of the proceedings this morning,

Mr. *Charles T. Bishop*, Chairman of the Gas Committee of the Corporation, was examined by Mr. BLENNERHASSETT. He said the population of the area of gas supply in Birmingham had grown from 477,524 in 1871 to 820,000 in 1901. The gas undertakings of the town were first under the control of the Corporation in 1876, when the quantity of gas sold and used on the works was 2400 million cubic feet. In 1902, this figure had increased to 5900 millions, which showed an average annual increase of over 4 per cent. compound. Having regard to these facts, the Gas Committee were of opinion that it was necessary to seek a fresh site. Whereas in 1876 there were 400 miles of main pipes, in 1902 there were 620 miles. The price charged to private consumers was, on consumption not exceeding 25,000 cubic feet, 2s. 9d., and over 25,000 to 250,000 cubic feet 2s. 3d., with a discount of 5 per cent. for prompt payment. In 1884, the price to ordinary consumers for public lights was 2s. 1d. to 2s. 5d.; but in that year the Corporation decided to reduce the price for public lighting to 1s., the effect of which was that the outside authorities had benefited by over £60,000. As regarded private consumers, the price charged inside the borough was the same as was charged outside; so that there was no ground for the allegation of the petition that the price charged outside was higher than it was inside.

Mr. LAMBERT: That is admitted; it is an error.

In further examination, witness said the progress of the Gas Department had been very steady, and the Gas Committee felt sure that it would continue. They had come to the conclusion that it was necessary to provide for an increased supply at the rate of 4½ per cent. compound—4 per cent. would be running rather close. The Corporation were providing for about 25 years ahead. In selecting the site, they had considered the point with regard to the locality in which the demand for gas during the last few years had been greatest; and in his view the present site met that requirement.

In cross-examination by Mr. LAMBERT, witness said gas-works might depreciate a high class of property; but they improved lower-class property, and increased the price of land generally. He could not admit that a district generally was depreciated by the presence of gas-works.

In cross-examination on behalf of Mr. Richards, witness said he did not think that fumes from the works would reach the nursery gardens.

Mr. *Henry Hack*, the Chief Engineer to the Gas Department, stated that in 1875 the Corporation acquired the then existing gas undertakings (the Birmingham and the Birmingham and Staffordshire Companies) which supplied in competition in the city of Birmingham. The two Companies had five works in 1875, which together were capable of producing 14⅛ million cubic feet of gas daily. The five works now had a capacity of 39¾ millions. The Swan Village works were about 6½ miles from the centre of Birmingham, and now supplied gas to Wednesbury, Darlaston, part of Handsworth, and small parts of Birmingham, Edgbaston, and Quinton. All the other districts were supplied from works within the city. At the Windsor Street works, only the site of two old houses was available for increasing the output. At the Nechells works, there were about 5 acres of land available for extensions; and arrangements had already been made to commence work there. The productive capacity there would be increased by 5 million cubic feet daily. It was contemplated to abandon the Adderley Street works with their capacity of 2¼ million cubic feet; and thus the 5 million cubic feet addition would become only 2¾ millions—making the total capacity 42½ millions. A reserve of 10 per cent. should be allowed, which would reduce the capacity to 38¼ millions.

Counsel was proceeding to ask as to the past rate of increase, when

The CHAIRMAN asked if this was material?

Mr. BLENNERHASSETT: Yes; for the purpose of showing the urgency of the works.

Mr. HUTCHINSON: I am not going to deny that Birmingham may not want an increase to its gas-works. The question is what damage it is going to do to me.

Mr. BLENNERHASSETT: The only question then is whether this is a proper place.

Mr. HUTCHINSON: I may have to meet the point that the Corporation might say these works are wanted at once. I may say, in support of my case, that at all events they have sufficient to go on with for two or three or five years. Within those limits, I shall not dispute the necessity.

In further examination, witness said in his opinion it was absolutely necessary that new works should be commenced with all reasonable dispatch. The site was admirably adapted for meeting the demands of the district. It would take nearly three years to complete one section of the works, including railway communication; and therefore it was necessary to commence the new works by the end of 1904, or very early in 1905.

In cross-examination by Mr. HUTCHINSON, witness said the first instalment of works with the railway connection would cost £500,000, and the gas produced for that would be about 10 million cubic feet a day. Ultimately, the Corporation would make 40 million daily there.

Sir *George Livesey* was the next witness called. He said he thought the Corporation had put off the acquisition of powers for making use of the site quite long enough. It was an ideal site, eminently suitable and most convenient in every way. A large area of land was necessary in order to construct extensive works; and where there was such an area, the works could be so arranged as to make them unobjectionable to the neighbourhood. In this particular case, the area should be large enough to at least double the make of gas. The doubling would take place in less than twenty years. He found that, taking the last four quinquennial periods, the increase had been at the rate of about 20 per cent. in five years; and there seemed to be no probability of its falling below that. The site was a good one. He did not think the works would do the inhabitants any harm. The necessity for the use of lime for purification was the thing which had given gas-works a bad name; but the use of oxide of iron had done away with the offensive effluvium, and was an equally effective purifier.

In cross-examination by Mr. LAMBERT, witness said the fumes from the slaking of coke did not travel very far; besides, mechanical contrivances were now used for slaking, obviating the necessity of doing it in the open. If lime were used for purification, the smell of a gas-works could be detected half-a-mile away; but where oxide of iron was used, that was not the case. Coke fumes fell within 100 yards.

In cross-examination by Mr. CLEES, witness said that gas-works, if properly conducted, did not emit an offensive smell. Asked if he should still think the site an ideal one if there were a considerable amount of running sand there, he said all the tanks of the South Metropolitan Company had been built in it. If the contractor did not take proper precautions in building tanks in running sand, the work would be more costly. All the contractor had to do was to sink his sump deep enough, well in advance of the work, to drain the running sand. That work meant money; but there were ways of overcoming it. To avoid going to the running sand, they could stop short of it; and instead of having a gasholder with three lifts, have one with six. At Greenwich, the ground was full of water at a depth of 14 ft. In order to avoid the expense of putting a tank into this water, they stopped short of the water, and gave six instead of three lifts; thus making the gasholder the cheapest they had ever constructed. If damage was done to Mr. Richards, he ought to be compensated.

Mr. *G. S. Mathews*, in reply to Mr. BLENNERHASSETT, said, in his opinion, the site more fully satisfied the conditions necessary for a gas-works than any other that he had seen. Mr. Richards's house, the "Rookery," was rated at £106. Thirty years ago it was one of the best mansions in the outskirts of Birmingham. Now the estate had been sold in lots; and the value it had when 90 acres surrounded it had passed away. He knew of no site where gas-works would depreciate the surrounding property so little. Of the site of 120 acres, 108 acres were bought for £15,500, which was at the rate of £144 per acre; but that included a very good house called "Glenthorn," the cost of which exceeded £12,000, and outhouses and ten cottages. The other portion was bought from a charity for £2500—£208 per acre. More had always to be paid for charity land. The character of this area was changing. Whereas it used to be occupied by good houses, a smaller class of property had been and was still being built there.

Cross-examined by Mr. HUTCHINSON: All the best houses in Erdington were out of sight of the proposed site.

Cross-examined by Mr. CLEES: The new works would damage some of the adjacent property—chiefly Birches Green, a house occupied by Dr. Evans. A certain amount of damage would be done to the business of the "Rookery;" but the land there would be appreciated. The fumes from the works might injure Mr. Richards's garden; it depended on where the works were placed.

Mr. *Wm. Fowler* gave evidence similar to Mr. Mathews.

This closed the case for the promoters. Evidence was then taken for the petitioners.

Mr. *E. R. Richards*, examined by Mr. CLEES, said he was the owner and occupier of the freehold estate called the "Rookery," which comprised 20 acres, and the value of which he estimated at £20,000. He paid £4000 for it in March, 1896, and had since spent considerable sums in erecting greenhouses, deepening wells, erecting electric plant, planting trees, repairing drains, &c. There were 29,000 square feet of glass in the garden, where he grew large quantities of delicate fruits having a ready market at the shops in the district. If the proposed works were like those at Saltley, they would take away his trade entirely. Nothing would grow within a long way of them. In addition to the damage entailed by the fumes from the works, he anticipated great annoyance from the cartage to and from the works.

Cross-examined by Mr. BLENNERHASSETT: He estimated the sum he had spent on the "Rookery" was at least £7000. He did not see how the gas-works would benefit his land.

In re-examination: Quite recently he had had an offer of £15,000 or £16,000 for his property.

Mr. *John Pope* said the presence of gas-works on the proposed site would render it impracticable to use the "Rookery" land as a nursery or market garden. It would be impossible to use the land for nursery purposes if within a mile there were works such as those at Saltley.

In cross-examination, witness said he based his evidence on experience, having himself had to move twice in 25 years.

Mr. CLEES then addressed the Committee. He said there could be no doubt that the erection of works on the proposed site must do considerable damage to Mr. Richards; and for that damage absolutely no compensation could be obtained at common law. There were no clauses in the Bill for his protection; and he therefore asked that it should be rejected.

Evidence was then called on the petition of the Erdington Council.

Mr. *J. Dawson*, Chairman of the Erdington Urban District Council, examined by Mr. HUTCHINSON, said the district had made very considerable progress; the population of 11,200 in 1894 having become 19,500 in 1903. The rateable value in 1895 was £45,000, and in 1903 £84,000; the number of houses having increased in the same period from 2326 to 4113. The indebtedness of the area was £23,800 in 1895, and now it was £52,000. There were two classes of population in the area—the better class living close to the proposed site. When the proposal of the Corporation became known in April or May, 1902, there was a great outcry from all classes of the inhabitants; and when the scheme matured, witness was authorized by the Council to attend in Parliament and oppose the Bill. That was the result of a poll. All classes resident at Erdington protested most earnestly against the proposal. The district was characterized by a semi-rural condition, in which cottage villas were extensively to be found, all having small gardens. The best class of artisans were eager to have them. They were all very much interested in their gardens; and those men having interviewed him, he knew that they resented very strongly any invasion of Erdington by gas-works and gas fumes. He knew of no instance where large gas-works had been dumped down without effecting the disastrous results he feared here. There was a very strong smell from gas-works. The charm of suburbanlife in Erdington would be destroyed by the proposal. Many of the best houses in the district would overlook the works.

In cross-examination, witness said if the site were laid out as cheap villas at £200 apiece, it was calculated it would produce as much in the way of rates as if it was used for gas-works. At a statutory public meeting, a resolution to oppose the Bill was defeated on a very small show of hands. At the poll, there were 1366 votes for and 1097 against the opposition; 511 papers being spoilt. The number of voters in the district was 2116—some having more than one vote.

Mr. *J. Rollason*, Vice-Chairman of the Erdington Council, and owner of Birches Green Estate and other land in the neighbourhood, thought the erection of gas-works would in all probability appreciate the value of the land for small low-class houses; but it was not to the interest of the district as a whole that his land should be developed in that way. Having regard to the true interest of the district, the works would cause the land to deteriorate in value.

Several witnesses were then called who gave evidence as to the charm, beauty, and healthiness of the district—all expressing the opinion that the construction of the gas-works on the proposed site would seriously interfere with its amenities, deteriorate the value of existing property, and lead to the building of inferior houses instead of houses of the better class, which were now being erected there. Specific instances were given in which the rents of houses had been largely reduced in consequence of the probability of the appearance of the gas works.

Mr. *E. H. Stevenson*, examined by Mr. HUTCHINSON, said the existing works of the Corporation would be sufficient until 1905. The proposed site was far from being ideal. It would require the siding connected with the Midland Railway to be made at a gradient of about 1 in 65. The site would be very costly in engineering, because of the stiff gradients. The Railway Company would insist on a siding between the line and the gas-works being connected to a lot of sidings on which waggons could lie. They would not allow a connection, of course, with the main-running line. This was not the kind of district which was usually fixed upon for the location of gas-works if other sites were available, as, he understood, was admitted to be the case, though whether they were as suitable as this one in the view of the Corporation was another matter. In his opinion, there were other sites as suitable, and more suitable; and if there were other sites quite as suitable, and which would not cause nuisance or trouble to a district, the Corporation should choose one of them.

The CHAIRMAN: Did you ever know any district that wanted to have gas-works?

Witness: No; but there are certain districts which cannot be damaged by gas-works coming, like a purely agricultural district.

In further examination witness said, in his opinion, it would be a very bad thing for Erdington if the works were erected there. Gas-works of any size deteriorated property in its neighbourhood; and the larger the works, the larger the area deteriorated.

Mr. HUTCHINSON: Do you think the circumstances here would justify the Council, both from your point of view as a gas engineer and from theirs as the authority of the district, in asking for the rejection of the site?

Witness: Yes; I think they are perfectly right in doing so.

In cross-examination by Mr. BLENNERHASSETT, witness said cheapness was the only good point of the site. There were other sites which the Corporation could make available; a portion of the land he referred to was under the control of the Corporation.

Wednesday, May 6.

Mr. HUTCHINSON addressed the Committee on behalf of the Urban District Council of Erdington, and asked them to reject the gas proposals of the Bill. By doing so, they would not be doing the Corporation of Birmingham any harm in relation to the carrying on of their gas undertaking; while, on the other hand, they would be averting, and Erdington saved from, a great disaster to the district. It was not contested that there was necessity for the enlargement of the gas-works; nor was there any dispute as to the time at which the necessity might become urgent and pressing. According to the promoters themselves, that would not be until the year 1905; and it might be put at two or three years later

han that. In the intervening time, having regard to the condition of things in and around Birmingham, other sites could be found which, though perhaps not quite as suitable, would be very nearly as suitable as the one selected. Cheapness appeared to be the principal consideration with the Corporation; and it was only because they had been able to obtain this site for such a low price, that they conceived the idea of putting works on it.

Mr. BLENNERHASSETT then replied on the whole case, referring first to the petition of Mr. Richards. The construction of the gas-works would place him in a most advantageous position instead of injuring him, seeing that in the event (which was anticipated) of a considerable demand for workmen's dwellings arising in the district, he would be able to obtain an enhanced price for his 20 acres as building land; and he could, at a much lower price, obtain purely agricultural land in another place where he could carry on his business as a market gardener. If a nuisance was created by the gas-works, Mr. Richards would have a complete remedy at common law, both by obtaining an injunction for the abatement of the nuisance, and, in the event of injury to his business, by recovering compensation. Having regard to these facts, Counsel held that Mr. Richards was not entitled to special protection. With reference to the case of the Erdington Urban District Council, the utter weakness of their case was indicated by the fact that the inhabitants were about equally divided in opinion as to the adoption by Birmingham of the site. If the inhabitants had been unanimous, or anything like unanimous, there would have been something to be said for their opposition; but no fewer than 1100 votes had been given against the proposition to oppose the Bill at all. The Corporation had done the very best that could be done, having regard to all the circumstances, to obtain a proper site for the extension of their undertaking—a site which Sir George Livesey said was ideal and suitable in every way—though he was bound to admit that in this, as in nearly every other case of the erection of gas-works, some damage would be done to the neighbouring property. Against this, however, was to be set the great public need; and he therefore asked the Committee to sanction the proposal.

The CHAIRMAN, upon the conclusion of Counsel's address, said the Committee found the preamble of the Bill, so far as it regarded the gas-works proposals, proved.

The clauses having been adjusted, the Bill was ordered for third reading.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Monday, May 4.

(*Before Mr. Justice* JOYCE.)

London County Council v. South Metropolitan Gas Company. The Sunday Gas-Testing Question.

This was an action brought to try the question whether the London County Council have a right to test gas on Sundays. The circumstances under which the proceedings were taken will be in the recollection of most of our readers; and the result was briefly recorded in the last number of the "JOURNAL."

Mr. T. R. HUGHES, K.C., and Mr. T. T. METHOLD appeared for the plaintiffs; Mr. WARMINGTON, K.C., Lord ROBERT CECIL, K.C., and Mr. L. ROSTRON represented the defendants.

Mr. HUGHES, in opening the case, said one of the multifarious duties imposed on the London County Council for the protection of the public was the testing of gas supplied by the different Metropolitan Gas Companies in three respects—illuminating power, purity, and pressure—and to see that the Companies fulfilled in these respects the statutory requirements. Three gentlemen, known as the Metropolitan Gas Referees, were appointed, who prescribed from time to time the mode in which the tests should be carried out by the Examiners who were appointed by the Council. It had always been the practice to test gas only on week days; but the Council considered it necessary to have power, when they thought fit, to test on Sundays also. The defendants objected, and said the Council had no right to make tests on Sundays, and had, in fact, refused to admit the Examiners to the testing-stations. The point raised by the defence was that for some forty or fifty years the Council and their predecessors (the Metropolitan Board of Works) had only tested on week days, and had thus put an interpretation on the Act which prevented them now carrying out their duties on Sundays. He should submit that this was not correct; and that if they had in fact neglected their duty for forty years, it was all the more reason that they should begin to do it now. Another defence raised was the Lord's Day Observance Act. But the Council did not ask the defendants to commit any breach of that Act; and if they did so, the responsibility, both on their conscience, and in respect of penalties, would rest on them, and not on the defendants. He would state shortly the various Acts which might be considered as material, although some of them had been repealed. The Company was formed in 1834, and with one or two changes of name, had existed ever since. The first Act, he believed, was the Metropolis Gas Act of 1860. Then in 1869 came the South Metropolitan Gas Act, under which Gas Referees were to be appointed, and the mode in which tests were to be made was laid down. In section 3 there was an interpretation of the word "day," which it said meant the 24 hours from 9 a.m. on one day to 9 a.m. on the next; so much of each day as was before 9 a.m. being reckoned as part of the immediately preceding day. So that, if Sunday were a *dies non*, Saturday would extend from 9 a.m. on Saturday to 9 a.m. on Monday; but the 24 hours from Saturday midnight to Sunday midnight would be excluded. By section 15 the Board of Trade were to appoint the Gas Referees. Sections 32 and 33 provided that the Gas Examiner should at each testing-place, test daily the illuminating power and purity of the gas supplied, and that there should be a test for illuminating power three times at least each day, at intervals of not less than one hour. Again, section 36 provided that each Examiner should on each day make and deliver a report of the result of the testings made by him on the preceding day, to the Metropolitan Board of Works, to the Chief Gas Examiner, and to the Company. The Chief Gas Examiner was a sort of Court of Appeal appointed by the Board of Trade; the Gas Examiners being appointed, as he had said, originally by the Metropolitan Board of Works, and now by the Council. Section 55 provided that if on any day the gas supply from a station was of less illuminating power than it ought to be, the Company should forfeit a certain sum; and the next was a corresponding section with regard to impurity. The next Act was one which was now in force, except in some trifling respects in which it had been altered. Section 10 repealed various sections of the previous Act; and the succeeding sections prescribed the minimum candle power and minimum pressure that the Gas Referees should prescribe, the mode to be adopted for testing, and the number of times of testing. Section 29 set forth that the Gas Referees should from time to time inspect the processes carried on at the works of the Company, with a view to ascertaining the means adopted for purifying the gas and preventing a nuisance; and they might from time to time apply all such tests as they thought expedient at the works of the Company or elsewhere to ascertain the amount of sulphur compounds, ammonia, and other impurities. Section 30 said that the Company should give the Referees, and each of them, access to the works, and should afford all facilities for the proper execution of their duties. Further sections provided that the Company should provide and maintain the apparatus and materials for testing; but these were to be prescribed by the Referees. The testing-places were to be under the control and management of the Metropolitan Board; but the Company might have separate testing-places in the same building under their own control and management. Section 41, which was repealed by the Act of 1880, but re-enacted, said the Gas Examiners should make daily such number of tests as the Referees prescribed; and section 44 said that the average of all the testings and purity on each day should be deemed the rate of purity of that day, with a proviso that if on any one day the gas was of less purity than it ought to be, the average of the testings made on that day and the preceding and following days should be deemed to represent the purity on such day. That was in favour of the Company to prevent their being liable for a mere accidental deficiency; and with regard to this matter difficulties had already arisen as to the Sunday. It was not very material on the construction of the Act; but it showed how difficulties might arise. Some Gas Companies had said, for example, that they could not take Friday, Saturday, and Monday, and take the average of the three; and therefore they could not be convicted for anything that happened on Saturday at all, because the Sunday could not be tested, and they were not entitled to take Friday, Saturday, and Monday as three consecutive days. The County Council said they could take Friday, Saturday, and Monday, because they did not in fact test on Sundays. This question had been discussed before one of the Magistrates; but he did not think his decision would be of much assistance to his Lordship on either side.

Justice JOYCE asked if a fine was imposed for deficiency.

Mr. HUGHES said it was called a forfeiture—£50 a day; and a serious difficulty did arise unless Sunday should be counted as one of the three consecutive days. The result really was that, if the defendants were right, they could not be convicted for Friday, Saturday, Sunday, or Monday, because they could not get three consecutive days. After referring to several other sections, he said they were repealed by the Act of 1880, and re-enacted with some alterations. This Act referred to the South Metropolitan Gas Company, the Gaslight and Coke Company, and the Commercial Company. Section 21 was the repealing section. Section 7 said that the Gas Examiner should, at each testing-place, make daily such number of tests as the Referees might prescribe for ascertaining each day the illuminating power and purity—the illuminating tests being taken at intervals of not less than one hour; and in the event of the gas being defective, the Examiners were to forthwith give notice to the Company. Sections 8 and 9 were similar to those in the former Act as to the average rate with regard to candle power and purity. Section 10 was, he believed, relied on by the defendants, which said the Company might, if they thought fit, be represented by an officer of their own. Such officer should not interfere with the test; and the controlling authority should state at what time it was proposed to make such test on any particular day on receiving a request in writing from the Company on the forenoon of the preceding day. There were several other sections which were only material, because they began "If on any day." Counsel then read the Notification issued by the Referees under the Act of 1892. It first prescribed and certified where the testing-places were to be for each of the three Companies. Then there were a group of provisions as to the time and mode of testing for illuminating power—three in number daily; but that if the average of three testings fell below the prescribed power, a fourth should be made. Then there were provisions as to the times and mode of testing for purity, which it said should not extend over less than 15 hours in each day, and should be made on 10 cubic feet of gas. This was of great importance, because the result was this: On Saturday, as the day only began at 9 a.m., there were only 15 hours precisely before midnight; and therefore it was practically impossible to get the test completed without running into the Sunday morning, using Sunday in the ordinary sense. The way the dispute arose here was as follows: The Council came to a resolution in October last to make tests on Sundays; but when the Examiners attended to make the tests, the Company declined to allow them to be made. He submitted that the Council were entitled, and bound, if they thought it necessary and proper to do so, to make the tests on Sundays as well as on weekdays. It seemed fairly clear that the obligation to supply gas extended to Sundays as well as weekdays; and it could not be said, therefore, that for all purposes Sunday was a *dies non* for the purposes of the Act, or that the Company would be justified in refusing to supply gas on Sundays. There was clearly no express provision excluding Sunday; and he submitted therefore that it was altogether the same as any other day,

There were no authorities precisely in point; but he would mention two or three which had some bearing upon it. In *Peacock v Regina*, it was held that, where three days were allowed for an application to the Justices to state a case for a Superior Court, the Sunday was to be reckoned in the three days. Mr. Justice Crowder said that, the statute saying nothing about Sunday being excluded or computed, it must be reckoned as one of the three days. Mr. Justice Willes took the same view; and so did Mr. Justice Byles, who said that Sunday at common law was just like any other day. There were three other cases to the same effect—that unless expressly excluded, Sunday was included as a day. It was obvious that gas companies might, if they chose, deliberately make on Sundays an entirely inferior quality of gas, giving less illuminating power, and putting in any quantity of impurities, without any proof of detection; and, in fact, if the defendants' contention were right, looking at section 9, there were only three days in the middle of the week where the test could be carried out effectively—namely, Tuesday, Wednesday, and Thursday.

Justice JOYCE asked what they said about Christmas Day and Good Friday.

Mr. HUGHES said he did not know.

Mr. WARMINGTON: That very point has been decided in our favour.

Mr. HUGHES said he did not at all agree; but he would tell his Lordship what his friend referred to. It was a case which arose with regard to another Company under the same Act. A prosecution was instituted against one of the Companies in respect of a defect in purity on a Saturday. For the purpose of proving the case, the plaintiffs put in the average of the Friday, Saturday, and Monday, because the test was not, in fact, made on the Sunday. The Company said these were not three consecutive days. They ought to have been Friday, Saturday, and Sunday. Now the present defendants said that they could not test on the Sunday; and so, putting the two arguments together, he did not think they were of much assistance. The point decided by the Magistrate was that, where they did not test on Sunday, the proper three days to be taken into account were Friday, Saturday, and Monday; and he (Counsel) had no doubt this decision was right, under the circumstances, because they were, in fact, not testing on Sunday, and the Company said the Examiners were not entitled to test. The common-sense view therefore was to take the three consecutive testing days—Friday, Saturday, and Monday. But it certainly did not amount to a ruling that they were not entitled to test on the Sunday; and the decision of the Magistrate, even if it had been that of the High Court, would not be binding in the present case. Paragraph 23 of the statement of defence seemed to be the material one—namely, that from 1869 to the present time the Gas Referees had issued a Notification prescribing daily gas testings, and duly-appointed Gas Examiners had tested gas in accordance with the Acts and Notification for the time being in force. Throughout the whole of this period such tests had been made on weekdays only, and never on Sundays; and the obligation of daily tests imposed by such Acts and Notification had been regarded and treated by the Gas Examiners and the public authorities as applying to weekdays alone. He thought this was accurate as a statement of fact, except to the extent that they had completed the purity tests after midnight on the Saturday. Then paragraph 24 of the statement of defence said that ever since 1872 or thereabouts Sunday had been treated by the defendants and other Metropolitan Gas Companies as a day of rest. The remainder of the paragraph showed that this was only true to a very limited extent, because it said the men stopped work at six o'clock and began again in some places at six and in others at ten o'clock; but during the interval between six and six or between six and ten, gas making was suspended. Then it went on to say that this suspension of work necessitated the making of more gas each weekday than was necessary, and thereby a large stock accumulated in the holders on Sunday morning to enable the supply to be met. Consequently the gas used on Sunday was mainly that made in excess during the week, and which had been subjected to weekday tests. He did not concede that the statement was altogether accurate. The 26th paragraph said if the gas were tested on Sunday, the caretakers employed by the defendants at the various testing-places, and other officers of the Company, would have to attend seven instead of six days. This was not necessary, because the plaintiffs would be quite content if they gave them a latch-key, which would get over the difficulty. Then it went on to say that, under the powers conferred by section 10 of the Act of 1880, the defendants must be represented at the tests on Sunday by some officer skilled in taking tests, more especially as the gentlemen appointed to test on Sunday were not the regular examiners, but supernumaries who might not be experienced in gas-testing. The first part of this was a mistake, because the provision of the statute was that the Gas Company might (not that they *must*) have an officer of their own present; and as regarded the experience of the Examiners, the responsibility for this rested on the plaintiffs. The defendants were not entitled to take any objection on that ground. With regard to the Sunday Observance Act, he did not know how this could be material. On this question there was only one authority which threw any light, and that a remote one, upon it. This was where a Navigation Company passed a bye-law that boats should not navigate the canal on Sundays; and it was held that the bye-law was unreasonable. He did not think there was any dispute as to the facts; and therefore he had no witness to call.

Mr. METHOLD said there were several other cases of a similar character to those mentioned by his learned leader, but he did not think it necessary to refer to them.

Mr. WARMINGTON, for the defendants, said that, to put the points quite shortly and generally, the case alleged was that the plaintiffs, under section 7 of the Act of 1880, had the right to test gas on Sunday; and the defendants denied such right. Whatever might have been his Lordship's opinion as to the meaning of the section had it stood alone, and without any previous history, he must point out that this came at the end of a series of Acts of Parliament in which the phrase or words upon which the plaintiffs relied had been used; and it was not right to suppose that Parliament, in re-enacting what was set forth in section 7, did not frame the Statute having regard to the practice which had hitherto obtained. The dates were conveniently set out in the statement of defence. The testing of gas by public authority was introduced for the first time in 1851; the Company being the Great Central Gas Consumers' Company. In 1854 it was applied to the Imperial Gaslight and Coke Company; and then it was made general throughout London by the Metropolis Gas Act of 1860. Up to then, nothing was said about daily testing. It was according to the discretion of the person described in all the Acts as the Chemical Examiner or Gas Engineer. The Act of 1860 applied to the thirteen Companies mentioned, who were afterwards reduced by amalgamation to three—viz., the Gaslight and Coke Company, the defendant Company, and the Commercial Gas Company. The testing under the Act of 1860 was continued by the Local Authorities from that time until 1868, but on weekdays only. In 1869 the South Metropolitan Gas Act was passed, and section 46 provided that the Gas Referees were to prescribe the testing-places, and the Local Authority appoint the Examiners. It said the Gas Examiners "shall at each testing-place, test daily the illuminating power and purity of the gas," &c. This was the first introduction of the daily test; and it was introduced as an imperative duty on the part of the Local Authority—"shall test daily." There was therefore a practice growing up in respect of which three Companies were concerned. The operation of testing, though it had to be carried out by an official appointed by the Local Authority, when done had to be made a matter of record in triplicate, a copy being sent to the Central Authority, to the Local Authority, and to the Company. So that there was a daily record of the testings of the Gas Companies' supply since 1869, and in the case of the City of London from 1868. Then came the Act of 1880. During the whole of this time they were dealing with Companies applying to Parliament and obtaining Acts. His submission was that section 7 of the Act of 1880 must be construed with reference to the reading and interpretation by the action of those who were parties to the test—namely, the Central Authority, the Local Authority, and the Gas Companies. There was not a suggestion that section 7 of the Act of 1880 was intended to introduce a new practice; on the contrary, his learned friend was obliged, in order to minimize the effect of this practice, to suggest that his own clients and their predecessors had been guilty of a breach of the Act of Parliament or a breach of duty. He said it was not so, but that, in truth, the practice which had grown up from 1868 until 1880 must be deemed to have been an interpretation of what was required by the statute, and that this uniform practice was not intended to be disturbed. In support of this contention, he would cite the case of the *River Wear Commissioners v. Adamson* (2 Appeal Cases, 743). This was a case where the words of an Act of Parliament clearly made the owners of any ship or float of timber liable for damage done to the harbour or quays; but it was held, notwithstanding this, in a case where the damage was occasioned by a vessel through the violence of the wind and waves at a time when the master and crew had been obliged to leave it, and had consequently no control over it, that the owners were not liable. Again, in *Hawkins v. Gathercole*, and one or two other cases, it had been laid down most clearly that, in construing a subsequent Act, the Judges were entitled to consider not only the actual words used, but also the practice which had grown up and existed at the time when the subsequent Act was passed. Now, in 1903, they were to go contrary to the practice which had existed all these years, and set up a new practice. Cases had come before the Justices, in which they took the average of three days where the validity of the conviction depended on the Sunday being a *dies non* for the purpose of testing; the Friday, Saturday, and Monday being treated as three consecutive days. He did not say this was binding, but he could produce the full report of the case decided by Mr. Bushby. There the matter was argued with great force by Mr. Roberts, for the London County Council, whose statement as to the true construction of the Act was adopted by the learned Magistrate. His submission was that Saturday, Monday, and Tuesday were three consecutive days, and that Sunday was a *dies non*. The learned Magistrate reserved his judgment for three weeks, and then before giving it, inquired if the obligation to test daily had hitherto only been observed by testing on weekdays. Having been informed that such was the case, he gave judgment in which he said that presumably, if the Legislature meant to enjoin more than was actually done, some such phrase as "Sundays not excepted" would have been added.

Justice JOYCE remarked that no such words were added in the clauses relating to the supply of gas.

Mr. WARMINGTON said he quite agreed, so far. Having read a further portion of Mr. Bushby's decision, he continued his argument. He said that, in the ordinary way, the better plan was to manufacture gas as it was likely to be required, and not to store it. But with regard to Sunday, when there was no manufacture going on except very partially, the practice was on each weekday to make more than would be consumed on that day; so that when the Saturday ended the gasholders were full ready for Sunday. He quite agreed that there ought to be a supply of gas on Sundays as well as on other days; and it might be said that persons who used it on Sunday ought to be protected just as much as persons using it on a week day; but he should have thought it was impossible to protect them better than they were now protected. The testing had not to be done on one particular day, but on the three days; and the result of what was done was that on the Sunday there was an accumulation of gas which had been tested during the preceding six days, so that no harm could be apprehended by the consumer on the Sunday. He did not think it could be suggested to be more than an academic question, or that the public were really interested in it. The only desire was to ask his Lordship to construe the statutes, in order that the true position of the authorities and the Companies might be ascertained.

Sir *George Livesey* was then called. He said the legal testing by a public authority commenced in 1860. Before that, there had been tests by the Company. Public officers, only the Medical Officer, used to come. They never came on Sunday. When testing-stations were established in the district, they were under the charge of the Company. No application was ever made to test on Sundays. The Company had frequently been to Parliament for additional powers. In each case the London County Council were their opponents; but no suggestion was

ever made by them as to the neglect of testing on Sundays. He never heard of testing on Sunday in any part of the country.

Mr. HUGHES said there were tests on Sunday in Liverpool.

Witness said testing was not legal in Liverpool on Sundays; it was excluded. The Company had incurred penalties where the three days average had omitted the Sunday. Testing on Sunday would confer no advantage on the public. About the year 1872, the Secretary of the Lord's Day Observance Society took action to induce the Gas Companies of London to abolish Sunday labour. Before that, they made as much gas on Sundays as on other days. The Engineers of the Metropolitan Gas Companies met and agreed to abolish Sunday gas making for twelve hours. This had been continued to the present day; and they had extended it whenever they could. He frequently stopped making gas from 6 a.m. to 10 p.m.; the object being to give as much relief as possible to the men. It cost the Company a considerable amount; but they gained in the improvement of the men. Formerly when they worked on Sunday there was a smaller consumption of gas; but they made the same quantity. The stock used to run down from Monday to Saturday, and on Saturday night they were often short; but they liked to make up the deficiency on Sunday and start on Monday morning with a good stock. When they altered the system, they reversed the process; and instead of making less gas than they required each week day, they had to make more each day up to Saturday than was required on the average, and accumulated sufficient in the holders to carry them over Sunday. Therefore, nearly all the gas in the holders on Sunday morning had been tested. They could not stop gas making at six o'clock in the morning on Sunday, because the retorts were charged in the winter every twenty minutes or half-hour. He would say for simplicity every hour—at one, two, and three, up to six o'clock. The coal put in at five o'clock was making a good rich gas up to about eight or nine; but that put in at two o'clock was off by eight, and was making poor gas. This gas, rich and poor, went forward into the gasholder, and about half-past eight or nine they let the surplus blow away into the air, because it was becoming too poor to be stored. The net result was that the gas was no worse on Sunday than on other days, but on the average was rather better. Tests had been made on Sunday at the works on two occasions—on Aug. 31 at Blackfriars Road, and on Sept. 7 at Hill Street. In both cases there was a greater variation from the average in the middle of the day than was usual, which was no doubt due to not being able to judge exactly the proper moment to turn the cocks and let the poor gas escape. The average illuminating power on Aug. 31 from 10 a.m. to 10 p.m., tested every half-hour during the day, was 14·9 candles; but the tests at 2.30, 3, and 3.30 were 14·2, 13·6, and 13·4 candles. The least mean of any three tests was 13·73 candles or 0·27 candle below the parliamentary standard; but not such as to cause a penalty, because the first penalty was for a deficiency of half-a-candle. On Sept. 7, the richest gas was sent out in those three hours. The average was 14·7 candles; the mean between 2 o'clock, 2.30, and 3 was 15·20 candles. This proved that, so far as the public were concerned, they suffered no damage whatever from the Sunday suspension of testing; but there was certainly a possibility of rather more variation in the quality. As far as he knew, there were no more complaints of the gas on Sundays than on other days. He had taken out the figures for March, 1902 and 1903, of the complaints received each week. They received complaints on those days, so that the percentage of complaints received on the Mondays was 17·19—as nearly as possible one-sixth of the whole; whereas it ought to represent the complaints for two days, Saturday and Sunday. The Company had been subjected to very few forfeitures the last twenty years. He would hand in a list of cases in some of which Sunday had been treated as a *dies non*.

In cross-examination, witness said they stopped charging the retorts on Sunday morning about six o'clock; but the gas making went on till about nine. Then it began to get too poor. In the ordinary case they drew the retort when the coal had been in for about 5½ hours; but on the Sunday it had to remain until the men came back on Sunday evening. After nine o'clock, the gas flowing from the retorts was blown off into the air instead of going into the holders. It was a poor gas, but would still be of some value for heating purposes; so that it involved considerable waste. This was what they paid, or part of what they paid, for stopping on Sundays. Somebody had to be there to turn the cocks, and also the engine-driver to stop the engine. He did not think it would be more satisfactory to have Sunday tests. They would not find any deficiency or defect which would be at all appreciable. If it were tested at two o'clock, the gas might be a fraction of a candle below the standard; but the public would not be damnified in the least, because at night it would be better than on a week night when they began to charge the retorts afresh. He did not anticipate that the Company would suffer or get any advantage from Sunday testing; but he objected to it because it tended to increase Sunday labour. He had written a letter in which he stated that, in order to make the gas of the same uniform quality throughout the Sunday as it was on week days, they would have to employ 80 to 100 men who previously had a day's rest on Sunday.

In reply to his LORDSHIP, witness said that, in order to supply gas of uniform quality throughout, the manufacture must be carried on uniformly and regularly.

Cross-examination continued: He had only taken the two Sunday tests he had referred to. They had a photometer test on the works, which gave a rough idea on the Sunday morning when to blow off the gas. He did not agree that a latchkey would remove all difficulty about the caretaker; and with regard to the Examiners, he said it took them some time to become experts. When they began, the tests were sometimes higher than they ought to have been, and sometimes lower; and the Company had had to spend large sums of money in times past to enrich the gas in order to make it pass the test for some weeks while the tester was learning his business.

Professor *Vivian B. Lewes* was next called. He said that during the whole time he had been connected with gas-testing in the City, the tests had been taken on every working day, but never on the Sunday. Daily records were taken and kept—he had about two van loads of them. He had made unofficial tests on the Sunday, and found the quality of the gas exactly the same as on week days. He did not consider it necessary in the interests of the consumer to test on Sundays. He lived during the winter in the district of the defendant Company, and never noticed any appreciable difference in the gas on Sundays.

In cross-examination, witness said he had occasionally made tests in the City on a Sunday in order to satisfy himself whether or no the allegation that the gas was worse on Sunday than on a week day was true. About once every four or five years such statements were put forward. He called those unofficial tests; and they were not recorded.

Mr. WARMINGTON said that was the defendants' case.

Lord ROBERT CECIL said he had not much to add to what had been already said by Mr. Warmington. He should submit that the expression "day" was capable of meaning either a working day or a running day. In ordinary life one often spoke of day, or daily, when it only meant working day, as in the case of the "Daily News" &c. In many cases, of course, "daily" included Sundays; but it depended on the whole circumstances under which the expression was used whether Sunday was included or not. He would admit that, *prima facie*, it would possibly include Sunday; but the whole question was what did "daily test" mean under section 7 of the Act of 1880. Where an obligation was imposed by statute which involved labour, there was at any rate some ground for thinking that, in the absence of an indication to the contrary, "daily" might very well exclude Sunday. After referring to the Lord's Day Observance Act, he said that his submission on this point was emphasized in a case in L. R., 10 Q. B., a case under a Charter Party, where Mr. Justice Lush said that lying days meant working days, because it involved working. This confirmed the view that where work was definitely to be done it indicated, generally speaking, that the word "day" meant working days, and not running days. It was a question of the interpretation of the Act of 1880; and he submitted that the expressions used in an Act must be interpreted according to the practice in the trade or occupation to which they were to be applied. In 1880, it was perfectly well known that the testing of gas on Sundays was absolutely unknown—it was not even conceived of as possible. The result of the evidence of Sir George Livesey was that, as to London, it was plain beyond controversy; and as far as any evidence went, it was equally plain as to the rest of the country. Already, in proceedings of a hostile character, Sunday, had been treated by a learned Magistrate as a *dies non;* and that appeared to him to be of great importance. The Act of 1880 was promoted by the predecessors in title of the London County Council; and it re-enacted the expression used in the former Acts "daily." It re-enacted section 9, which provided for the test for purity being the average for three consecutive days; and it had been shewn that Monday had been treated as a day consecutive to Saturday in spite of the intervention of Sunday. This brought the case exactly within the principle to which Lord Macnaghten referred in one of the cases already mentioned. As to the importance of this test, he did not propose to say anything. If his learned friend were right in strict law, it did not matter whether it was important or unimportant. The whole question was what did "daily" mean? He asked his Lordship to say that there was nothing which compelled him to say that "daily" included Sundays.

His LORDSHIP asked if section 3 of the Act of 1869, which was no repealed, was to be read with the Act of 1880.

Mr. HUGHES said that it was so.

His LORDSHIP said that he need not trouble Mr. Hughes further. The question, as had been very justly put by Lord Robert Cecil, was what was the meaning of the word "daily" in section 7 of the Act of 1880. He thought, without looking at the dictionary, one might venture to say that *prima facie* the meaning of daily was every day, though they had in this case the peculiar provision with reference to days which was contained of section 3 of the Act of 1869—namely, that the term day meant, except in that section, 24 hours from 9 a.m. on one day to 9 a.m. in the forenoon of the next following day; so much of each day as was before nine o'clock in the forenoon being reckoned as part of the preceding day. Therefore, it appeared to him *prima facie* the effect of section 7 of the Act of 1880, with reference to the Company in question, was that the gas was to be tested as therein prescribed on every day beginning at nine o'clock in the forencon of one day and ending at nine o'clock in the forenoon of the next day. If this were so, two of those days would include parts of Sunday, which, as he understood, began at twelve o'clock on Saturday night and ended at twelve o'clock on Sunday. It was said that, from the provisions of this section, the 24 hours from midnight on Saturday to midnight on Sunday must be altogether excluded; but as he understood, there was not a word, or an expression of any sort or kind, in any of the Acts of Parliament to suggest that this was the case, or was the intention of the Legislature. *Prima facie* he should suppose that where, as here, gas was to be supplied at all times—on every day, and every hour of the day—the testings ought to regularly take place on every day of the week. With regard to the argument of the defendants against this construction, and in favour of their contention, how and where did they get any particular intention so to speak as it was called in one of the cases at variance with and contrary to the literal words of the Act. Many not altogether relevant topics had been urged upon him, though he did not think it necessary to exclude them or stop the evidence. But the principal point was this, that it was the practice, from the passing of the Act of 1868 down to the passing of the Act of 1880, not to test on Sundays. In other words, the practice had been not to comply with the literal directions of the Act of Parliament applying to the case. Could that alter the meaning of the word "daily" in the Act? It was suggested that this could be done on the principle mentioned by Lord Macnaghten in one of the cases, where undoubtedly it was suggested that, when they found the Legislature following a continuous practice, repeating the very words on which that practice was founded, it might probably be fairly inferred that the Legislature, in re-enacting the statute, intended those words to be understood in their received meaning; and it might be argued that the inference grew stronger at each successive enactment. But Lord Macnaghten expressed no opinion upon it. His opinion was that if this was a sound principle on which to construe Acts of Parliament, the practice in this particular case, assuming it to be established

under the circumstances, was not nearly sufficient for the purpose of founding upon it any really serious argument to the effect which the defendants desired him to do. In his opinion, the words were plain. He was asked to put a construction on the statute which was contrary to the words of the Act—a construction which, as it appeared to him, would lead to the greatest possible difficulty in working. He had not the least reason to suspect that it was brought to the attention of the Legislature when the Act of 1880 was passed, that there was any such practice as was now alleged; and the result of the whole thing in his mind was this: He really did not even suspect that the Legislature did not intend that which was provided in section 7 of the Act—namely, that testing should be daily, and every day, without excepting Sunday in any way whatever. He supposed the plaintiffs only wanted a declaration.

Mr. HUGHES said a declaration in the terms of the first prayer of the claim would be sufficient; and in the ordinary course he must ask for the costs. He supposed the other side would do the same if they were successful elsewhere.

His LORDSHIP said he supposed all the Companies were going to contribute to the expense.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Wednesday, May 6.

(*Before the* LORD CHIEF JUSTICE *and Justices* WILLS *and* CHANNELL.)

Kidd v. Charing Cross and Strand Electricity Supply Corporation, Limited—Claim arising out of the Panton Street Explosion.

These were two appeals from a decision of his Honour Judge Woodfall in a case tried before him, with a Jury, at the Westminster County Court, on the 20th of January last, as reported in the "JOURNAL" at the time. It may be remembered that it was a claim by a workman named Kidd, in the service of the above-named Corporation, for compensation, under the Employers' Liability Act, for injury resulting from an explosion in an electric-light box in Panton Street, Haymarket, on Sept. 9, 1902. At the hearing, his Honour left the following questions to the Jury: (1) Was there a defect in the plant—(*a*) in the ventilating cover of the box, (*b*) in the plugging of the spare-way? (2) If so, did the defect arise from, or had it not been discovered owing to the negligence of, the defendants? (3) Was the plaintiff bound to conform to the orders of Durston [the foreman in charge]? (4) If so, was Durston negligent? (5) Could the plaintiff, by the exercise of reasonable care, have avoided the accident? (5A) Having regard to the emergency, was the plaintiff negligent in obeying the second order given by Durston? The answers to the first four questions were in the affirmative, as was also that to the fifth; but in this case the Jury added that if Kidd had refused to obey orders he would have been discharged if there had been a further explosion. To the last question the answer was "No." A verdict was given for £150 damages; and his Honour, after taking time to consider his judgment, gave it for this amount, with costs. The defendants appealed against the refusal of the Judge to grant a new trial, for judgment in their favour, or a new trial on the following grounds: (1) That the Judge was wrong in law; (2) that the plaintiff was guilty of contributory negligence; (3) that the Judge ought not to have left the last question (5A) to the Jury, inasmuch as they had been discharged, and Counsel for the plaintiff had improperly entered into conversation with them before this had been done; and (4) that there was no evidence before the Jury that the plaintiff would have been discharged if he had refused to obey the second order of Durston.

Mr. LONGSTAFFE appeared for the appellants; Mr. M. O'CONNOR, Mr. J. DUNCAN, and Mr. M. O'SULLIVAN represented the plaintiff in the original proceedings.

Mr. LONGSTAFFE explained the facts of the case, as follows: A fire broke out, on the morning of the 9th of September, in a service-box between the Haymarket and the Comedy Theatre. Durston, a navvy ganger, was at work in St. Martin's Lane, in charge of a squad of navvies who were attended by a jointer and fitter, the plaintiff Kidd. Durston called upon Kidd to get his tools together at once and disconnect the cable on which the fire was raging. On arriving at a bus-bar box next to the box which was alight, Durston directed Kidd to disconnect. Kidd remonstrated, and suggested a box farther from the scene of the fire. Durston again peremptorily directed him to "get down at once," adding "or we shall all be blown up." Kidd thereupon unscrewed the nut, with the result that an electric arc was completed, causing a spark, and an explosion of the heavy gases. The jointer was blown across the street, and sustained serious injuries. Counsel argued in support of the notice of motion.

Counsel on the other side were not called upon to reply.

The LORD CHIEF JUSTICE said the Corporation had no right of appeal on the point that the learned Judge was wrong in law in finding for the plaintiff, inasmuch as the Jury found for him on all the questions left to them. On the second contention, of contributory negligence, it could not be urged against the plaintiff that he had been guilty of any. It was not contributory negligence to obey orders to undergo a risk in order to avoid a greater danger; and the Jury had said that he would have been dismissed if he had refused to obey his orders. Moreover, they had expressly found that the plaintiff was not guilty of contributory negligence in obeying the order of the foreman ganger. On the fourth contention, that there was no evidence before the Jury that the plaintiff would have been discharged if he had refused to obey his order, his Lordship invited Counsel for the Corporation to read the Judge's notes. From these, it appeared that the plaintiff had stated that he would have been discharged if he had refused to disconnect the cable. It could not, therefore, be argued that there was no evidence. It might be stated by Counsel that he did not believe the evidence; but that was a different matter from stating that there was no evidence. As a point of law regulating appeals from the County Court, an appeal would lie only on the ground that there was no evidence. The learned Judge in the Court below had held as a fact that there was some evidence to go to the Jury; and he had confirmed his finding by refusing a new trial. The question had been raised that Durston, a navvy ganger, had no jurisdiction over a skilled workman, a jointer and fitter. His Lordship read from the Judge's notes that Kidd had been told by his Superintendent to take his instructions from Durston while on the night job, and there had been no denial of this. Moreover, that question could not be raised, as it was not stated in the notice of motion. For the same reason, it could not then be urged that there was no evidence of negligence on the part of Durston—defects in the ventilation of the British insulated wire cover, or defects in the plugging of the spare-way. Counsel for the Corporation had referred to the condemnation of the cover as a matter of great concern. It was in use all over the country, and was found to be a satisfactory means of ventilation. His Lordship remarked on this point that the judgment against the Corporation merely went so far as to condemn the cover in this particular instance. It might or might not be a satisfactory means of ventilation. The fire arose from some defect in the circuit system which led to circuit with earth, sparking, and the ignition of the bituminous cover of the cable. The gases passed through the defectively sealed spare-way from the service-box to the bus-bar box, where they again ignited when the electrical currents short-circuited and sparked, on disconnection.

Both appeals were dismissed, with costs.

Damaging a Prepayment Meter.

At the Huddersfield Borough Police Court, last week, John Potts was summoned by the Longwood Gas Company for stealing a quality of gas value 19s. and with wilfully damaging a gas-meter. Defendant had in his house a prepayment meter, which until February of the present year worked all right. Between February and April, which was about the length of time which elapsed between the visits of the collector, a considerable quantity of gas was consumed through the meter. The collector going round on April 21 found that there was only 1s. 3d. in the box. In the interval, the glass covering the dials had been broken. The meter was examined; and it was ascertained that by altering one of the pointers a quantity of gas passed through free, but this amount was registered on the dials below. Defendant, on oath, denied that he had tampered with the meter. He did not break the glass cover; and he could not account for the increase in the consumption of gas registered by the meter from 4s. between December and February to 18s. between February and April. Mr. Welsh, for the defence, appealed to the Bench not to set the evidence of a gas-meter, with the vagaries meters were guilty of, against the sworn evidence of the defendant. The Bench dismissed the charge of larceny, and fined defendant 40s. and the costs, 22s., for damaging the meter.

Action Regarding a Gas Explosion.

On Monday and Tuesday last, in the King's Bench Division of the High Court, before Mr. Justice Darling and a Common Jury, the case of Ruffa *v.* Minter was heard. It was an action by Mr. J. Ruffa, Manager of the United Carlo Gatti, Stevenson, and Slaters, Ltd., ice merchants, against Mr. F. G. Minter, a builder, for damages for personal injuries caused by a gas explosion, which plaintiff alleged occurred by reason of defendant's negligence. Mr. R. T. Colam appeared for the plaintiff; Mr. Clavell Salter for the defendant. Plaintiff's case was that about Aug. 25 last the defendant agreed with plaintiff's employers to remove some gas-fittings, the property of the Company, from certain premises, and to fit them up at the plaintiff's house at Peckham. This was done, and plaintiff alleged that by the negligence of defendant's servants a large volume of gas escaped, and a violent explosion took place causing plaintiff serious injury. He alleged that defendant's servants omitted to fill a chandelier with water, and left the gas-meter turned on. Plaintiff's sight and hearing were injured; and he had been for some time, and was still, unable to work. The defendants pleaded that the explosion was not due to any action on the part of their servants, but was caused, or contributed to, by the negligence of the plaintiff in taking a naked light into a room in which he had reason to think the gas was escaping. Mr. M'Leod, an Inspector of the South Metropolitan Gas Company, said he examined the house two days after the explosion, and found the tubes of the chandelier perfectly dry. It was quite impossible for the water to have been thrown out with a jerk of the explosion. He examined the chandelier in the other room, where there had been no explosion; and there was no water there either. When he turned the meter on, gas escaped freely from both chandeliers. He tested the chandelier with water in it, and found that it held gas perfectly well. In reply to one of the Jury, witness said the Company did not make or supply water gas; it was all coal gas. In the result, the Jury found for the defendant. Judgment was given accordingly, with costs; but execution was stayed in view of an appeal.

Dorking Gas Company and the Electric Light Scheme.—The Solicitors to the Dorking Gas Company have intimated to the Council that the Directors have decided to withdraw their opposition to the local electric lighting scheme. It will be remembered (*ante*, p. 38) that a threat was made to apply for an injunction to restrain the Council from carrying into effect a contract they had entered into with Edmundsons, Limited.

The Proposed Municipal Lighting Plant for New York.—In the article on "Public Lighting in American Cities" which appeared in the "JOURNAL" for the 14th ult., reference was made in the opening paragraph to the circumstance that Mr. R. G. Monroe, the Commissioner for Gas, Electricity, and Water Supply in New York, had recommended the installation of municipal plant for the public lighting of the city. A Bill was introduced by him to carry out the idea; but it has been defeated in both the Assembly and the Senate, though by comparatively narrow majorities. It is expected that the Bill will be re-introduced next session.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of the Association was held last Tuesday, at the Cannon Street Hotel—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. R. W. Wilson) read the notice convening the meeting, and also the following report of the Directors :—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament, for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended Dec. 31 last.

The following summary shows the results of the Association's operations during that period: The quantity of gas made during the past half year was 4358 million cubic feet; the quantity made in the corresponding half year of 1901 was 4071 millions—an increase of 287 millions, or at the rate of 7·04 per cent.

The total number of lights on Dec. 31 last was 2,789,487; at the close of the corresponding half year it was 2,569,829—an increase of 219,658, or at the rate of 8 per cent.

The number of consumers on the books of the Association at the close of the half year was 247,845—an increase in the twelve months of 21,601, or at the rate of 9·1 per cent.

The total mileage of mains in use on Dec. 31, 1902, was 1926 miles; being an increase of 47 miles in the half year.

The gross cost of coal was 1s. 3d. per ton less than in the corresponding half year; but the effect of this reduction was more than neutralized by the depreciation in the value of coke, with the result that the net cost of coal was 9½d. per ton more than in the second half of 1901.

The revenue from the sale of tar and its products showed a slight falling off; but this was more than compensated by improved values obtained for ammonia products.

The plant and mains at all the stations were maintained in a due state of efficiency.

The profit, as shown by the balance-sheet of the Association for the half year under review, exhibits an increase of £25,000. This favourable result may be attributed to the considerable increase in the sales of gas, and to economies in working expenses.

A monopoly of the supply of gas for 25 years has been secured in Deurne—a suburb of the city of Antwerp.

At Berlin the Directors obtained a ten years' prolongation—*i.e.*, until 1953—of the Association's contract with the suburban Commune of Lankwitz.

An exclusive concession until 1924 for the supply of gas and electricity was negotiated with the Commune of Berchem Ste. Agathe—a suburb of Brussels.

The Association's contract with the town of Haarlem terminated on Dec. 31 last, when the Municipal Authorities took up the supply of gas from the works which they have themselves erected. The authorities have taken over from the Association on equitable terms the freehold land forming the site of the works, the whole system of mains and services, and the lamp-posts, meters, and fittings on hire.

At the new Mariendorf works at Berlin, the masonry work of a second gasholder tank, of 243 feet diameter, was finished; and the connection with the State Railway was completed. At the Weissensee works, the storage capacity was increased by telescoping one of the existing single-lift gasholders.

At the Koekelberg works, Brussels, the four-lift gasholder, of a capacity of 1 million cubic feet, was finished, and put in action. At the same works, hydraulic stoking machinery—removed from the Association's former works at Erdberg (Vienna)—is being usefully employed.

At Komotau, a new two-lift gasholder, of 200,000 cubic feet capacity, was completed; while a small gasholder, which was no longer required there, was removed and re-erected at Saaz.

At Vienna, a gasholder of 350,000 cubic feet capacity, removed from the Erdberg works, was re-erected at the Floridsdorf works; while another gasholder, of 630,000 cubic feet capacity, removed from the Belvedere works, was re-erected at Baumgarten.

The Directors availed themselves of a favourable opportunity to dispose of the remainder of the Association's landed property at Amsterdam. Land for which there was no further use at Vienna was also sold on advantageous terms.

The vacancy created on the Board by the death of Sir James Morse Carmichael, Bart., has been filled by the election of Mr. Corbet Woodall, formerly Consulting Engineer to the Association.

The Directors desire to record their sincere regret at the death, on Jan. 18 last, of Sir Joseph Sebag Montefiore, who had been an Auditor of the Association for 44 years.

In conclusion, the Directors desire to draw the attention of the proprietors to the accounts for the half year ended Dec. 31 last. These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended Dec. 31 last, payable, free of income-tax, on and after Tuesday, the 12th inst.

The Directors who go out of office by rotation are: Robert Tindall, Esq., Sir Charles Jessel, Bart., and John Henry Birchenough, Esq. These gentlemen are eligible for re-election and offer themselves accordingly.

Owing to the death of Sir Joseph Sebag Montefiore, a vacancy has arisen in the office of Auditor, which it rests with the proprietors to fill. The following gentlemen, who are duly qualified, have given notice of their intention to offer themselves as candidates: J. Gurney Fox, Esq., and Percy J. Harding, Esq.

The CHAIRMAN said it became his duty to move—"That the report of the Directors upon the affairs of the Association, which has been read, be received and adopted, and entered on the minutes." Before commencing his remarks with regard to the accounts, and the operations of the Association during the half year under review, he thought it only right to the proprietors present to explain how it was that he was filling the position of Chairman instead of Mr. Newton. He regretted to say that ten weeks since Mr. Newton was very unwell; and his medical advisers insisted upon his seeking complete rest in a warmer climate—in Sicily. Mr. Newton left them with the full intention of returning in time for this meeting; but only on the previous Wednesday, he (the Chairman) received a letter from him, saying he deeply regretted that the state of his health would not allow him to be present. He desired him to express his sorrow that he could not be with them; and he (the Chairman) was sure that the proprietors would extend their sympathy to Mr. Newton, especially when he told them that for forty years he had given his best attention to the affairs of the Association. In commenting upon the report and accounts, he (the Chairman) proposed to deal in the first instance with the latter. It had been a matter of great satisfaction to the Board that the past half year had turned out so well. There was no question about this, because they were in the position to declare the usual dividend, without trenching in any way upon the fund that the proprietors themselves agreed should be set aside, and which was called the dividend equalization fund. He would ask the proprietors to let him explain—to take them into his confidence as it were—as to how the Board arrived at the profits. The sum which they had brought into account for the purpose of dividend was £197,000. They took, in the first instance, the profits at the stations; and, after making the necessary deductions for income-tax and other charges, they further made a deduction for the amortization of concessions, which extended, as the proprietors were aware, over various periods of time. This was worked out upon an actuarial basis. Then, this half year, the Directors had thought fit to make a still further reduction from the profit, inasmuch as they had in the balance-sheet a certain number of gilt-edged securities, which were purchased some years ago at a time, as the proprietors knew, when such securities were very high; and, to place the accounts on a proper basis, the Directors thought fit to write these securities down to their actual market value on December 31 last. These remarks did not refer to the securities which stood in the reserve fund. He wished to say a few words with regard to that fund. As they knew, it was a fund which was only dealt with by the proprietors—that was to say, by the Directors only with the sanction and approval of the proprietors. Therefore, the Directors were always loth to touch it in any way without the full approval and sanction of the proprietors. The amount had stood for a good many years at £400,000 in Consols, purchased at a cost of £397,300. The interest, as the proprietors were aware, had been reduced to 2½ per cent. The rate at which the Board purchased these Consols worked out at 99¾ per cent.; and it had occurred to him whether it would not be well, with the proprietors' consent, to write down this reserve fund to an average cost—say, to 93 or 95 per cent. He merely mentioned this at this meeting, because (as he said) the Directors were always extremely loth to deal with this fund without consulting or having the approval of the proprietors; and if the idea commended itself to the general body of those present, some expression of opinion might be made after he had concluded his remarks. There was only one other matter with regard to the accounts to which he wished to refer. It must be within the knowledge of the proprietors, or a good many of them, that, with an expanding business, like theirs was in some of the great capitals of Europe, it was impossible to avoid making large capital expenditure. During the past five years, they had spent a very considerable amount; and he foresaw, as their business continued to expand, that they would have to spend in the future very large additional sums on capital account. This was merely foreshadowing what he believed would take place. They were so far in a position to meet that capital expenditure, because, as the proprietors were no doubt aware, the authorized capital of the Association was £4,200,000, of which only £3,800,000 had been issued. They also had borrowing powers to the extent of one-quarter of their issued capital—that was to say, they had power to borrow £950,000 on debentures, and of this amount they had still £476,000 available, or unissued. He thought it well to bring this matter forcibly before the proprietors that day, because, owing to the continuous growth of the business, it might be necessary to issue either new debentures or new debenture stock, and eventually new capital stock. So much with regard to the accounts. He would now like to make a few remarks as to what they had done during the half year, and as to their prospects at the stations. This part of his review might be comprised in two words—"progress" and "peace." Progress generally came with peace; and prosperity as a rule followed, if there was good management. But he also wished to allude very briefly—briefly because he could not go into great detail with so varied a business as theirs—to some of the principal events at their chief stations. First of all, of course, he must refer to Berlin. Their business there was growing, and had grown in the last few years, to such an enormous extent owing (as he thought he mentioned six months ago on his return from a visit to Berlin) to the way in which Berlin was extending in its south-western suburbs. There were places there just like South Kensington; and there were places which it was believed would in the future be like Acton, Ealing, and Hammersmith. The Directors had thought fit, through the advice of their able Managers at that place, to conclude contracts far out of Berlin, but still it was believed, having an eye to the future, these suburbs would eventually prove of very great profit to the Association. Now just to give the proprietors some idea of the magnitude of that work, he might say they were dealing with thirty different concessions all round Berlin. Most of them were of great length, and besides the Association had large interests in other undertakings round about that city. He wished here to place on record a recognition of the extraordinary assistance the Directors had derived, in connection with their operations in Berlin, from the gentleman who managed what he might call their political affairs in that city. His was a name that would probably be very well known to the proprietors. It was Mr. Delbrück. His father was a very good friend to the Association; and he filled the same place that his son now occupied. On that son's shoulders had worthily fallen the mantle of a very illustrious father; and he had done—he (the Chairman) could hardly say how much he had done to further the interests of the Association. It might interest the proprietors to know that Mr. Delbrück had been able to spare a few days from his very busy time in Berlin to come to London to be with them on this occasion, though he was so much engrossed in the affairs of that great Company which he (the Chairman) had no doubt the proprietors had seen had been started in Germany—the Krupp Company, of which Mr. Delbrück is one of the members of the Advisory Committee. At Antwerp, the business of the Association was progressing in a most satisfactory way. As the report told them, they had concluded

a contract with one of the communes outside. Since the preparation of the report, too, the Directors had concluded a contract with another growing commune; and they were in negotiation with several other communes there, which they believed would be a source of prosperity to the Association. Their Engineer (Mr. Brender à Brandis) was always hard at work in protecting their interests in that city. Of Brussels also, the same story could be told. They were ably represented there by Mr. Salomons, who was always looking out for means of extending the business in the rapidly growing suburbs of the city. He (the Chairman) also wished to say a few words with reference to Frankfort. It would be remembered that six months ago the Board gave the proprietors some information with regard to the arrangements which were made with their competing Gas Company in the city by which—well, the competition would not be so severe. This arrangement had now been working for a year. It was brought about almost entirely by the very able manner in which it was handled by their Manager and Engineer there—Mr. William Drory. It had worked exceedingly well; and he (the Chairman) had not the slightest doubt that, under Mr. Drory's supervision, the arrangement would work equally well in the future. There was a point of interest with regard to Mr. Drory; and it only showed the devotion and tenacity with which their Engineers clung to the Association. It was this, that, with this year, Mr. Drory completed 50 years devoted service to the Association. Now respecting Hanover, he (the Chairman) had little to say. It was one of their important stations; and the work there had been extraordinarily well done under the able management of Mr. Körting. The past half year, however, had been a period of great quiet at Hanover; and so there was nothing of particular interest for him to report in regard to that station. He next came to what might be to some of the shareholders a new station. It was Lieben-Prague. Some time ago—he thought in October, 1900—the Board had an opportunity of purchasing the concessions there. After very careful consideration, they did so, and embarked a certain amount of the capital of the Association in the concern. But shortly after they took possession, doubts were raised by the Municipality as to the validity of certain of the contracts—as to whether they could be transferred from the people who purchased them to the Association. But, thanks to the able manner in which Dr. Teltscher, who was the Company's representative in Austria, handled the matter, negotiations had been conducted, and carried through, on a reasonable and fair footing; and the business was now on a more secure basis—a contract having been concluded with the authorities until 1962, with a right to the Corporation to purchase the works within a fixed period at a fixed sum, which would be quite satisfactory to the Directors. He hoped his fellow Directors and proprietors would not think he had been drawing too rosy a view of the operations of the Association. However, it now fell to him to have to refer to the loss of a station. As the report stated, they had ceased work at Haarlem. This station they had lighted since 1837; but notwithstanding all the efforts of the Directors to renew the contract, the Corporation were quite determined to supply gas, and have works of their own. Consequently, the work of the Association had to cease at Haarlem. But the capital invested there, under the arrangement he had explained in dealing with the accounts, was fully amortized at the end of the contract; and they had it in hand now to meet outlay at other places. The liquidation of their affairs there would result satisfactorily, as they had been able to sell everything outside the works—mains, services, lamp-posts, meters, &c. Besides which they had sold to the authorities the site of the works at its market value; and the buildings were disposed of *en bloc* to the contractors, so that they had not cost the Association anything for removal, but had, indeed, put something into their pocket. He should also like to make a little reference to Vienna. It would be remembered that they were confined in that city to the suburbs—the suburbs round Vienna, and what might be called the suburbs across the Danube. There had been a large increase in these suburbs, as there always was in the suburbs of large Continental towns; and the Association had been obliged to increase their works there. But the profit had been very considerable. The outlay for the materials on those extensions had been met by transferring the plant from their disused works at Vienna to those in the suburbs; so that really this had not been what might be absolutely called a cash outlay—it had been, as it were, merely a transfer of plant from one station to another. Their contract with the suburbs on the right bank of the Danube did not end until 1911; but, owing to the foresight of Mr. Woodall, and their Engineer (Mr. Egeler), they need not contemplate any further large capital outlay there through the remaining years of their business at Vienna, which years, he (the Chairman) was confident, would prove profitable ones for the Association. At the last meeting, a proprietor asked the then Chairman for information with regard to the money invested by the Association in electrical undertakings. He (the Chairman) did not know whether that gentleman was present at this meeeting; but the reply he might give him was this: It was true that from time to time the Association had invested money in electrical undertakings in various towns. There was a great deal of policy connected with this investment. Sometimes their hands were rather forced with regard to the investment; sometimes the Directors thought it was good policy to propitiate municipalities; in other cases, they introduced electricity with the firm belief that it would be profitable to the Association as an absolute paying interest, and so it had proved at Lille, where, under the able management of their own Gas Engineer (Mr. Delebecque), the electric light works paid a dividend—and a fair dividend too. But he (the Chairman) did not pretend that the return for their money on electric light undertakings—whether at Vienna, Berlin, or wherever it might be—came up to the return they received from gas. It did not. He hoped there were no purely electrical men present, as perhaps they would say, "You are a gas man, and so completely prejudiced." However, that was the information he was glad to be in a position to give the shareholder who asked the question six months ago. He had no further remarks to make, except to express the regret of the Board—and he was sure the proprietors would sympathize with this—that they had lost a valuable Auditor by the death of Sir Joseph Sebag Montefiore. For 44 years, he audited the accounts of the Association with the greatest care; and in that work his large knowledge of Continental exchanges and Continental values was of very considerable assistance. He (the Chairman) had understood that they were going to have a contest for the vacant auditorship; and he was perhaps rather looking forward to the dull proceedings of a company meeting being enlivened by a contest. However, he was now told that, at the last moment, one of the candidates (Mr. Percy J. Harding) had withdrawn his candidature; and therefore Mr. J. Gurney Fox would be the only candidate before the proprietors.

Colonel J. WILKINSON seconded the motion, which, without discussion, was unanimously adopted.

The CHAIRMAN next proposed the declaration of a dividend of 5 per cent. (free of income-tax) for the half year on the £3,800,000 stock of the Association; remarking that he regretted to say the Association would have to pay 1s. 3d. in the pound on the profits.

Colonel WILKINSON seconded the proposition, which was unanimously carried.

The retiring Directors (Mr. R. Tindall, Sir Charles Jessel, Bart., and Mr. J. H. Birchenough) were unanimously re-elected, on the motion of the CHAIRMAN, seconded respectively by Mr. C. PIGOU, Sir CHANDOS LEIGH, and Mr. CORBET WOODALL. Referring to the absence of Mr. Birchenough, it was explained by the Chairman that he had been deputed by the Government to proceed to South Africa to report on the commerce available there for British enterprise. The Directors looked upon it as a great compliment that one of their number should have been selected for so honourable a duty.

In appropriate terms Mr. BERNARD HARRIS moved, and Mr. M. S. PILCHER (who is one of the Auditors) seconded, the election to the vacant auditorship of Mr. J. Gurney Fox; and the motion was unanimously passed.

Proposed by Mr. R. HESKETH JONES, and seconded by Colonel MITCHELL, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, having acknowledged the compliment, said he wished to move a special vote of thanks to their officers and staffs at the various stations, and to their Secretary and the London staff. He would ask Mr. Woodall to second this, as he had been brought into such intimate relationship with the staffs on the Continent for so many years.

Mr. CORBET WOODALL said he was much obliged to the Chairman for having given him, as his first duty in that room as a Director of the Association, the very congenial task of seconding this resolution. It might be said of this Association more than of most companies he thought, that it was very much what its officers had made it. He believed that they, as an Association, had good reason to be proud of the repute in which they were held in the many important cities and towns where they performed important duties. Their relations with the Municipalities were invariably good and friendly, and in many cases cordial. Now, so far as the Directors were concerned, they very rarely had the opportunity of coming into contact with the representative people of the towns they served; but their officers were always there. And he did think the excellent position in which the Association stood in this respect, as well as the admirable results they had had detailed to them by the Chairman, showed how excellently they were served. Speaking after a considerable number of years' association with these gentlemen—especially with the Engineers—he could only say he had always found them full of zeal, energy, and ability, and possessed of an excellent *esprit de corps*, but without any rivalry, except as to who should serve the Association best. He had the utmost satisfaction, as he had had at all times, in testifying to the admirable manner in which the Association was served by their officers; and he seconded the motion with unfeigned pleasure.

The motion was heartily agreed to; and this ended the proceedings.

BOMBAY GAS COMPANY, LIMITED.

The Ordinary Meeting of this Company was held on Thursday, at the London Offices, No. 6, Drapers' Gardens, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. J. Hill Perrins) having read the notice calling the meeting, the report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he must apologize for his appearance in the chair; but their Chairman (Mr. Robert Davidson), who, he was sorry to say, was slightly indisposed, had asked him to take his place on this occasion. This would be the loss of the shareholders, because he (Mr. Jones) could not hope to put the accounts before them in the lucid and complete manner that Mr Davidson had always done. The Company had not been without history since the shareholders last met. They had had the misfortune to lose one of their oldest and most valued Directors—Mr. Charles Gandon. This was, indeed, a great deprivation to the Board, because Mr. Gandon had formerly been in the Company's service as the responsible Engineer and Manager in Bombay; and so, of course, he brought to their counsels such close knowledge of all the details of the gas-works and business that his loss was indeed a serious one. However, the Board had anticipated the wishes of the shareholders by sending to Mr. Gandon's family a vote of condolence, expressing the Directors and shareholders' sense of the great loss the Company generally had suffered by their colleague's unfortunate decease. In pursuance of their authority, the Directors felt they could not possibly do better than elect—indeed, they felt they had great advantage in the possession on their list of shareholders, and in the temporary office of Auditor, of a gentleman who had all the qualifications which he had just mentioned as attaching to Mr. Gandon. In Mr. Louis Penny, who had been seventeen years in Bombay as the Company's responsible Manager and Engineer, they had that special experience of Bombay affairs, that special knowledge of all the physical facts connected with their business, and that knowledge of all the details of their gas-works and their condition, that their late friend had; and therefore it was most desirable the Board should avail themselves of that skill and experience by inviting Mr. Penny to take the

vacant seat. It would be his (the Chairman's) great pleasure to move a special resolution asking the shareholders, as he had no doubt they would do most heartily, to confirm the Directors' choice. In dealing with the accounts, he should do so very shortly, for they spoke for themselves. Those who had put the accounts in comparison with the previous year would have seen that the business had increased considerably. The rental from gas—both private and public—had increased something like 10½ per cent. If the shareholders would bear in mind that in Bombay at the present moment there was raging a terrible plague, which was worse than it had been during the past five years, and that they had not been free from it at any time during those five years, they would understand that it must interfere materially with the progress of an undertaking such as theirs; and it spoke volumes for the energy and the business capacity of the present Manager (Mr. F. W. Chamberlain) that he had succeeded, in the face of the general depression of trade and this serious plague, in extending the business of the Company so largely. This had necessarily led to a great increase in the receipts on the revenue side of the account; but they had had, like other companies, a loss on the sale of the residuals. While the increase in the sale of gas furnished something like £4414, there was a loss on coke of about £4777. To explain this, he must tell the shareholders that all classes of fuel in India had been cheaper. It had been possible for people to buy coal on much more favourable terms than formerly; and so they would not go to the price they had been giving the Company for coke. On the other hand, going to the expenditure side, they had realized a saving of £5547 on the cost of coal. Therefore under this head they gained some advantage to set against the loss on coke. Even this was not the whole story, because a good deal of the coal—and a larger quantity than in the preceding year—was bought on this side; and, in paying for it, money had to be sent across, which submitted the Company to an extra loss in exchange. This item of exchange stood at the large total of £16,753. It would therefore be seen that the loss on coke practically extinguished, for the time being, the benefit of the increase in the income from gas; but this loss on coke was only a temporary one, because the Company had accumulated a large stock, which they had to get rid of. Then the saving in coal had been largely neutralized by the increase in the exchange. The exchange, too, was £1300 more by reason of the fact—which was a most important one—that they had reduced the amount of money owing for gas in Bombay from £15,253 last year to £10,171 now. He might say that, in consequence of the plague, and people moving out of the city, it became very difficult indeed to collect the gas revenue. The Board, however, looked on this with great anxiety, and sent out most strenuous instructions, that at any sacrifice of cost for clerical aid, the Manager must get in this money; and they had succeeded in reducing the amount by more than 33 per cent. But, in sending that money over, they had incurred this year a loss on exchange which would have been charged in the previous year. Therefore the item of exchange appeared much greater than it would otherwise have been. The result was they had secured a net profit of £15,420, which was sufficient, within about £180, to pay the dividend, which was a modest, but satisfactory one. He should not apologize for the small deficiency, because they were carrying forward an available balance of £8862 from which the second half-year's dividend of £8400 would be paid. The Company were in just as good, and even better, a position now than, he thought, they had been for some time past. He said better for these reasons—that the increase of 10 per cent. in the sales of their gas would, without a doubt, continue in the future. The loss on coke, which was simply due to the value acting upon their large stocks this year, was not likely to recur. Again, they would not be sending over so much money, as that which was outstanding had now been collected down to narrower limits. Therefore, there would not be the same large increase in exchange. Short of some misfortunes which they could not foresee, and which they did not think likely to happen, unless the plague paralyzed Bombay altogether, the promise was, with the large increase in the sale of gas, and the greater economy in the purchase of coal (without those attendant disadvantages which the past year had had to experience), a period of greater prosperity. The concern was being thoroughly well maintained in condition, and they were sending out additional retorts for a larger business this year. Their Manager thought, as they had had an increase of 10½ per cent. in the past year, they would go still further in the future. Therefore, there appeared to be every prospect of the year through which they were now passing being at least as good as the past year; and his (the Chairman's) private opinion was it would be somewhat better. As a point of interest, he might mention that one of the most important hotels in Bombay, which had been lighted by electricity for many years, had abandoned it and reverted to gas lighting with the Welsbach burner. In conclusion, the Chairman moved the adoption of the report and accounts and the declaration of a dividend of 3½ per cent., free of income-tax, making 6½ per cent. for the year.

Major W. F. GORDON seconded the motion.

Mr. CUFF congratulated the Board on being able, under the circumstances, to give the shareholders such a good report, which was evidence of the thorough care with which the business was carried on. He should like to know whether the charge for the maintenance of Welsbach mantles—£4983—for the public lighting was an arbitrary amount; seeing that it was nearly the same as last year. Then as to the increase of about £1000 in the trade and general charges, he supposed that was on account of the effort made to collect in the debts on the other side. In reference to the use of native and English coal, he supposed it depended on their price, the rate of exchange, and the cost of freight as to whether more or less of one than the other was used. If the Company only had a year without the serious drawbacks to which the Chairman had alluded, the report the Directors would be able to present would, he thought, be a splendid one.

The CHAIRMAN said it was a serious omission of his not to have dealt with the question of the Welsbach mantles. The charge in the accounts was for the public lighting. It would be remembered that they secured the last contract for public lighting by the aid of the Welsbach mantle. They had an almost fixed number of lamps, which was only slightly added to; and therefore the expenditure from year to year came out nearly the same. It was, he must confess, much too large a charge; and the Directors had been trying to secure a reduction of the cost from their contractor for mantles. The price of mantles had been reduced everywhere in this country and on the Continent; and if they could obtain a reduction in Bombay, they would be in a position to go to the Municipality and say: "We are perfectly willing, now that we can buy mantles cheaper, to give you the benefit of the reduction. But to the great disappointment of the Board, there appeared to be legal difficulties in the way of realizing the reduction. The Directors had consulted their Solicitors in Bombay; but they had not yet succeeded in producing from their contractor a satisfactory reply on the matter. As to the trade and general charges, there was an increase in salaries—partly due to the change in the staff and partly to the expenses incurred in connection with the collection, and largely due to the improvements now in hand. With regard to coal, the policy of the Directors had been to avail themselves of native products as far as possible—first, because it encouraged native enterprise, and, secondly, because the Company avoided the loss on exchange in paying for coal that was bought on this side. The Directors were giving every attention to this; and lately they had found an Indian coal of a much superior quality to that they had hitherto been able to get. They had therefore made a contract, on reasonable terms, for a larger quantity of this coal than they had had in the past.

Mr. F. R. SMITH remarked that, if it was possible to get a reduction in price from the contract for mantles, and they voluntarily offered the reduction to the Municipality, he thought it would do a great deal of good when they came to consider the question of a renewal of the contract for public lighting.

The motion was unanimously carried.

Resolutions were next passed, re-electing the retiring Directors (Major W. Fletcher Gordon and Mr. H. E. Jones), confirming the election of Mr. Louis Penny, and reappointing as Auditors Mr. Magnus Ohren and Mr. G. E. Robinson.

The usual complimentary votes to the Chairman and Directors, the Manager and staff in Bombay, and the Secretary and London staff were very heartily passed; and the proceedings terminated.

THE EXAMINATIONS IN GAS MANUFACTURE.

The Question Papers Set at the City and Guilds of London Institute Examinations.

HONOURS GRADE.

1. Explain fully how you would proceed to dry and bring up to carbonizing temperature a new bed of retorts fired by means of a generator and provided with regenerators. State the precautions you would take to avoid any explosion of gas within the setting. 2. Discuss the relative advantages and disadvantages of setting the retorts in a bed of eights in two or three vertical rows. 3. Describe, with the aid of sketches, the construction of any one form of atmospheric condenser, and state how you would modify the working of the condenser to meet fluctuations in the volume of gas passing through it and variations in the atmospheric temperature. 4. Sketch the construction of the Livesey washer, and explain the various functions which it performs. 5. At a works removing the sulphuretted hydrogen by means of oxide of iron, the average amount of this impurity is 1·2 per cent. What average quantity of oxygen in the crude gas would be most suitable for effective purification, and how would you determine the amount of air, if any, which should be added, allowing for that already present in the gas? 6. What objects are attained by the use of an exhauster? Sketch, without unnecessary detail, the construction of a rotary exhauster. 7. What is the approximate composition of the following gases: (*a*) Purified coal gas; (*b*) purified carburetted water gas; (*c*) "blue" water gas? State in general terms the effect of each constituent on (*a*) the illuminating power and (*b*) the calorific power of the gas. 8. Describe the construction of the incandescent burner. How would you ascertain, when fixing it, that the gas and air supplies were properly adjusted for the local conditions, and what precautions must be taken to maintain the burner in working order? 9. How would you proceed to regulate the pressures on the district in case of failure of the governor from any cause? 10. Give an account of the general properties of ammoniacal liquor, mentioning its most important constituents. What is the difference between the "volatile" and "fixed" ammonia, and how would you determine the amount of each in a sample?

ORDINARY GRADE.

1. Sketch the sections of retorts in most common use, and explain the manner in which the mouthpiece is attached to the retort. 2. Give some account of the causes of stopped ascension-pipes, and of the means of preventing their occurrence. 3. What is the meaning of the term "condensation" of gas? In what parts of the plant is this effected, and what bye-products result from it? 4. How would you determine the amount of ammonia remaining in the gas after the scrubbers? Why is it advisable to reduce this to the lowest possible limit? 5. Sketch the construction of a purifier and cover, showing the manner in which the gas passes through. How would you test the gas at the outlet for sulphuretted hydrogen and carbonic acid? 6. What are the chemical changes which take place when lime is used as purifying material (*a*) when the sulphuretted hydrogen has been previously removed; (*b*) when both sulphuretted hydrogen and carbonic acid are present? 7. Explain, with the aid of sketches, the general construction and method of working of a governor controlling the gas supply in the district. 8. How are cast-iron mains jointed, and in what manner are the service-pipes connected to them? What precautions must be taken in laying the latter? 9. What are the relative advantages of wet and dry gas-meters? 10. Describe a method of estimating the total quantity of sulphur in purified illuminating gas.

In the ordinary grade, 39 marks were allowed for Nos. 2, 5, 6, and 7, and 36 for each of the rest. In the honours grade, 39 marks were allowed for Nos. 1, 4, 5, and 8, and 36 for each of the rest. Four hours were allowed for each paper; and not more than eight questions were to be attempted.

BIRMINGHAM GAS AND WATER SUPPLY.

Annual Reports.

The Gas and Water Committees of the Birmingham Corporation have issued their reports for the year ending the 31st of March.

In the Gas Department there was a gross profit of £178,606. After providing for annuities and interest, and making due provision for the sinking fund, a net profit of £56,920 2s. 5d. has resulted, which the Committee recommend shall be appropriated in aid of the improvement rate. If this recommendation is approved, there will have been contributed to public purposes out of the funds of the gas undertaking during the year ended March 31 last a total of £81,001, made up as follows: Improvement rate, £56,920; do. (interest on reserve fund), £4000; Coronation illuminations, £1337; public lighting, £11,061; lighting courts, £3065; and lighting outside the city, £4617. Comparative tables are given showing that the sales of gas increased during the year from 5921 to 6132 million cubic feet, and the number of new services from 5653 to 6566. The demand for prepayment meters continues, and no less than 5557 houses were fitted and new accounts opened during the year.

The Water Committee report that the water-rents for the year show a total increase of £4515; being 1·79 per cent., against 4·36 per cent. in the previous year. The domestic rental shows an advance of 3·28 per cent., whereas in the measured supplies for trade and public purposes there has been a decrease of 0·89 per cent. This is attributable to some extent to the lessened demand for road-watering, consequent upon the broken weather throughout the past year, and also, to a large extent, to general slackness of trade among manufacturers. The revenue account shows a gross profit of £149,890; being an increase of £6932 on the figure for the year 1901-2. The charges on account of capital result in an adverse balance of £80,039. This has been covered by a transfer of the balance of the special water fund, amounting to £36,278, and a transfer from the reserve fund account of £43,761. The balance remaining to the credit of the latter account is £6239. The Committee also report certain circumstances connected with the Elan supply; but they do not predict when the scheme will be completed. The amount expended on the works in the Elan Valley during the year was £190,439; making a total of £1,400,248. The expenditure on the whole scheme during the year was £458,300; bringing up the total to £4,903,096.

Cape Town and District Gas Company, Limited.—The Directors recommend a dividend at the rate of 10 per cent. per annum on the ordinary shares for the half year ended the 31st of December, making 10 per cent. for the year. After debiting £5900 to repair and maintenance, and placing £7000 to the reserve account, which will then stand at £16,000, and after writing off all the charges relating to the recent issue of debenture stock, the balance carried forward is about £2000.

GAS PROFITS AT WIGAN.

Alderman Holmes, the Chairman of the Gas Committee, announced at last Wednesday's meeting of the Wigan Borough Council that the amount of gas profit allocated this year in aid of the district rate was £11,800, or equal to 1s. 3d. in the pound; and he said he trusted that the ratepayers of the town generally would, along with the Gas Committee, appreciate the services of the Engineer (Mr. J. Timmins) and his staff in securing the handsome results that had accrued from the year's working, which stood out as a record. Mr. Fyans remarked that it was a magnificent thing that this sum had been transferred to the relief of the rates; but it would be interesting to know into whose pockets the greater portion of the relief went. He ventured to submit that, if the time had not arrived, it would arrive in the near future, when it would be the bounden duty of the Council to take into consideration the channel into which those profits flowed. There could be no two opinions on the fact that great mills and industries which contributed not a single penny to the gas-works in any other way than as rateable value for loan purposes were the greatest beneficiaries under this division of profits; and he believed that the people as a whole who used the gas ought to be the ones to receive the first consideration in the distribution of the profits of the undertaking. It must not be said that the owners of manufactories had the same interest in the undertaking because their rateable value was taxed, and that it was upon the value of those places that the money was borrowed for gas-works purposes. As the gas was mainly sold to the poor, he advocated that they should receive the first consideration, either by the whole of the profits being given up to the users of gas, or the cost of gas being of such a character as merely to allow of a reasonable reserve for the payment of interest and sinking fund. He asked the Chairman of the Gas Committee to take into consideration the question of reducing the price of gas. The minutes of the Committee were confirmed; but at a later stage in the proceedings, when the minutes of the Finance Committee were under consideration, the same subject cropped up again. Speaking of the gas profits, Mr. Wood, the Vice-Chairman of the Finance Committee, said he knew there were different opinions as to whether this money should go to the relief of the rates or not; but he wished to ask what would happen if there was a deficit instead of a surplus. Where would that come from? He thought it would come from the same place as the surplus was going to. They were having an actual experience now of this principle, when any deficit that there had been in the electric lighting and tramways undertaking was to come out of the district fund, and any surplus earned by them in future was to go to the benefit of the fund from which they were getting their relief now. Mr. Segrave remarked that this question had been before the Council time after time. He did not see any reason why the gas consumers of the borough should not participate in the profits of the department. It was not fair or reasonable that they should pay more for their gas in Wigan, in the heart of a coal district, than was paid in

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 361.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	April 17	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Nov. 13	6½	Bombay, Ltd. . . .	5⅞—6¼	..	5 4 0
140,000	5	,,	6½	Do. New, £4 paid	4¼—4⅝	..	5 9 5
380,000	Stk.	Feb. 26	12	Brentford Consolidated	240—245	..	4 18 0
286,700	,,	,,	9	Do. New . . .	178—183	+1	4 18 4
50,000	,,	,,	5	Do. 5 p.c. Pref. .	131—136	..	3 13 6
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb. .	110—113	..	3 10 10
220,000	Stk.	Mar. 12	10½	Brighton & Hove Orig.	209—214	..	5 0 5
246,320	,,	,,	7½	Do. A. Ord. Stk. .	151—156	..	4 19 4
460,000	20	Mar. 31	10	British	39—40	..	5 0 0
100,000	Stk.	Mar. 12	6	Bromley, 5 p.c. "A". .	118—123	..	4 17 7
165,700	,,	,,	4½	Do. 3½ p.c. "B". .	90—95	..	4 14 9
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	11⅝—12¼	+¼	5 14 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	54—56	+1	4 3 4
150,000	20	Mar. 12	8¼	Cagliari, Ltd. . .	23—25	..	6 12 0
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54*	..	5 11 1
1,375,000	Stk.	Feb. 26	5	Commercial 4 p.c. Stk.	103—106	−1	4 14 4
503,750	,,	,,	4¾	Do. 3½ p.c. ,,	99—102	..	4 13 2
407,812	,,	—	3	Do. 3 p.c. Deb.,,	89—92	..	3 5 3
800,000	Stk.	Dec. 11	8	Continental Union, Ltd.	115—125	..	6 8 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
575,000	Stk.	Feb. 26	5⅛	Crystal Palace Ord. 5 p.c.	115—120	..	4 8 10
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0
106,158	,,	Jan. 15	5	Do. 5 p.c. Deb. Stk.	137—140	..	3 11 5
486,090	10	Jan. 29	10½	European, Ltd. . . .	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Feb. 12	4 4/16	Gas- 4 p.c. Ord. . .	87—89	+4	4 18 10
2,600,000	,,	,,	3½	light 3½ p.c. max. .	85—87	..	4 0 6
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	109—111	+1	3 12 1
4,193,975	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	88—90	..	3 6 8
252,500	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Oct. 30	8	Hongkong & China, Ltd.	15—16	..	5 0 0
3,800,000	Stk.	Nov. 13	10	Imperial Continental .	203—206	..	4 17 1
473,600	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	100—103	..	3 8 0
165,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	115—120	..	5 0 0
561,000	Stk.	Feb. 26	10	Liverpool United A	218—220	..	4 10 11
718,100	,,	,,	7	Do. do. B .	163—165	+1	4 4 10
306,083	,,	Dec. 31	4	Do. do. Deb. Stk.	113—115	..	3 9 7
75,000	5	Dec. 11	5	Malta & Medn., Ltd. .	4⅛—5	..	5 0 0
560,000	100	April 1	5	Met. of 5 p.c. Deb.	103—107	..	4 13 6
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 13	3½	Monte Video, Ltd. . .	10—11	..	6 7 4
1,515,892	Stk.	Feb. 20	4½	Newc'tle & G'tesh d Con.	103½—104½	..	4 6 2
376,855	Stk.	Jan. 2	3½	Do. 3½ p.c. Deb.	96½—97½	−½	3 11 10
300,000	Stk.	Nov. 27	8	Oriental, Ltd. . . .	143—148	..	5 8 1
600,000	5	Mar. 31	7	Ottoman, Ltd. . . .	6—7	..	5 0 0
					* Ex. div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
105,005	Stk.	Jan. 15	6½	Ply'mth & St'house 5 p.c	127—132	..	4 12 9
851,070	10	April 30	7	River Plate Ord. . .	11¼—11⅜*	−⅛	5 19 2
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb..	95—97	+1	4 2 6
250,000	10	April 17	8	San Paulo, Ltd.. . .	12—13	..	6 3 1
135,000	Stk.	Mar. 12	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	237—240	..	4 3 4
523,498	,,	,,	10	Do. C	237—239	..	4 3 8
103,235	Stk.	Mar. 31	5	Shrewsbury Ord. 5 p.c.	111—114	..	4 7 9
6,000,000	Stk.	Feb. 12	5⅜	South Met., 4 p.c. Ord.	118—121	..	4 8 2
1,780,000	,,	Jan. 15	3	Do. 3 p.c. Deb. . .	90—92	..	3 5 3
380,940	Stk.	Nov. 13	5	Southampton Ord. . .	105—110	..	4 10 11
87,950	,,	Jan. 15	4	Do. 4 p.c. Deb.	103—106	..	3 15 6
120,000	Stk.	Feb. 26	6	Tottenham and Edmonton A. 5 p.c.	117—122	..	4 18 4
300,520	,,	,,	4½	Edmonton B. 3½ p.c.	96—99	..	4 10 11
182,380	10	Dec. 30	8	Tuscan, Ltd.. . . .	8½—9½	..	8 8 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	94—96	..	5 4 2
730,872	Stk.	Mar. 12	5	West Ham, 5 p.c. Ord.	95—100	..	5 0 0
				WATER COMPANIES.			
780,662	Stk.	Dec. 30	11⅓	Chelsea, Ord. . .	315—325	..	3 10 9
150,000	,,	,,	5	Do. 5 p.c. Pref. .	145—150	..	3 6 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	130—140	..	3 4 4
175,785	,,	Mar. 31	4½	Do. 4½ p.c. Deb. .	137—142	..	3 3 5
1,720,560	Stk.	Mar. 31	8	East London, Ord.. .	235—240	..	3 6 8
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb. .	142—147	..	3 1 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb. .	96—98	..	3 1 3
700,000	50	Dec. 11	10†	Grand Junction 10 p.c. max.. 4 p.c. Deb..	135—140	+12	3 11 5
310,000	Stk.	Mar. 31	4		123—128	..	3 2 6
708,000	Stk.	Feb. 26	10½	Kent	295—305	..	3 8 10
160,000	,,	,,	7	Do. New, 7 p.c. max..	195—205	..	3 8 4
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max..	305—315	..	3 9 0
406,200	100	,,	8½	Do. 7½ p.c. max..	220—230	..	3 13 11
350,000	Stk.	Mar. 31	4	Do. 4 p.c. Deb..	122—127	..	3 3 0
500,000	100	Feb. 12	12 5/16	New River, New Shares	390—400	..	3 4 0
1,000,000	Stk.	Jan. 29	4	Do. 4 p.c. Deb..	123—128	..	3 2 6
902,300	Stk.	Dec. 11	7	South-wark and Ord. . . 7½ p.c. max. 5 p.c. Pref.	230—235	..	2 19 7
126 500	100	,,	7		205—215	..	3 5 1
489,200	Stk.	,,	5		150—153	..	3 5 4
1,019,585	,,	Mar. 31	4	Vauxhall 4 p.c. A Deb.	122—127	..	3 3 0
1,155,066	Stk.	Dec. 11	10	West Middlesex. . .	295—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	138—143	..	3 2 11
200,000	,,	Mar. 12	3	Do. 3 p.c. Deb. .	95—97	..	3 1 10
					* Ex. div.		

† Next dividend will be at this rate.

other towns many miles from the coalfields. The Council ought to encourage the people of the town to use gas; but they were not likely to so encourage them if they charged extravagant prices for it. Why should he, as a gas consumer, contribute to the rates of some big mill-owner who manufactured his own gas or used electric light? Why should the gas consumer be taxed for the relief of the electricity department? Unless some arrangement was made by those who had the power to alter the present state of things, he should take the necessary steps to raise the question in the Council by moving a resolution. Alderman Holmes said the Gas Committee, at their next meeting, would bring forward this matter; but he could not promise that they would go so far as some might wish them to do. They had to look at a good many things. They had seven different district councils to supply with gas; and if they brought down the price to one level all round, and any accident or explosion occurred, the cost would have to be borne absolutely by the Wigan ratepayers. They must be careful, and mind where they were going.

MIDDLETON CORPORATION GAS SUPPLY.

Loss on the Working.

At the Meeting of the Middleton Town Council last Thursday, Mr. Mills, in moving the adoption of the report of the Gas and Electricity Committee, stated that on Tuesday the Committee passed their accounts for the year ending March 31. The income was as follows: Gas sold, £15,004 12s. 1d.; total income, £19,811 9s. 4d.; total expenditure, £19,923 13s. 6d.—showing a loss of £112 4s. 2d. This did not take into account the amount required for retort renewals, on which the Committee had already spent £1850. Towards this amount £100 was provided in 1901 and £300 in 1902. The Committee decided that it would not be wise to set aside this year a less sum than £850; bringing up the total loss to £962 4s. 2d. The loss in 1902 was £3715, and had they made the same allowance for retort renewals, it would have been £4275 7s. 5d., or a difference of £3313 3s. 3d., which might be considered not so bad; though to a certain extent it was a disappointment to the Committee, and no doubt to the Council. The Committee were fully alive to the importance of the closest vigilance in the management of the works, but at present they had to face the fact that they had in stock about 750 tons of coal and cannel nuts, which had cost, on an average, 13s. 9d. per ton, and which on testing were not worth more than 9s. 4d. per ton. Besides, they had a further stock of 565 tons of coal and cannel, which must have considerably depreciated; and this the Committee were determined to decrease during the coming financial year to the utmost extent. They had lost some £400 on stoves; and they had decided that the rental—viz., 6 per cent. on their cost—was not sufficient. They had now raised the rental to 10 per cent.; and this should somewhat lessen the loss in the current twelve months. Mr. Wiggins said they could not make the gas-works pay as they were going on at present. They would either want coal to come down 2s. a ton, or would have to increase the price of gas 3d. per 1000 cubic feet, before they could make the undertaking financially successful. If they could get an increased consumption of 10 million cubic feet per annum, they would just be able to come out on the right side. The minutes were passed.

TEIGNMOUTH GAS SUPPLY.

At the Meeting of the Teignmouth Urban District Council last Tuesday, the Gas Manager (Mr. J. A. Gray) presented his annual report, which showed a net profit of £254 on the year's working. The interest on the loan and the payment to the sinking fund amounted to £1311. As in the case of a company this would have been available for dividend, it might be said that the gross profit was £1565, or equal to 9·3 per cent. on the capital invested. New mains had been laid down; and if a loan had been raised for them, the profit would have been £200 more. The price of gas sold was 5d. per 1000 cubic feet less than in the previous year. The coal contract was most advantageous. Unscreened Newcastle coal only had been used, and complaints as to the quality of the gas were conspicuous by their absence. The total quantity of gas made during the year was 25,268,770 cubic feet; being an increase of 1,470,000 cubic feet on the make in 1901. Additional sales to private consumers totalled 1,546,400 cubic feet. This fact pointed to a reduced leakage account; the increased sales being greater than the larger make. The number of public lamps had also been increased. The quantity of gas made per ton of coal carbonized—8493 cubic feet—was very low. But by the new plant in course of erection, the gas-producing capacity would be practically doubled. Mr. Gray referred to the prospect of having an electric competitor in the town, and pointed out that if the consumption of gas had to be maintained, every effort would require to be made to encourage and foster it. A decreased consumption of gas would raise the cost of production; and the reverse applied with an augmented consumption. Gas was the cheapest illuminant on the market, and the public lighting of the town should be used as far as possible to indicate to the ratepayers the great efficiency which could be obtained. With regard to the profit shown on the balance-sheet, a reduction had already been effected on the street lighting, of £200 per annum. This was a direct relief to the rates, and was equivalent to 2d. per 1000 cubic feet on the total sales. The price of gas was reduced to 4s. per 1000 cubic feet. Commenting upon the report, a local paper characterized it as the most encouraging document the Council had received for many a year, for the gas-works had been lifted out of their Slough of Despond and chronic financial loss.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	ACCRINGTON	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000		

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . . 1,800,000 Cub. Ft.

BALLYMENA GAS-WORKS PURCHASE.

The Award.

The award in the matter of the arbitration to ascertain the price to be paid by the Ballymena District Council for the works of the local Gas Company was issued some time since; but a copy of the award has only come to hand within the past few days. The market value of the undertaking and property was fixed at £25,926; and it is understood that the stock on the works—coal, coke, tar, sulphate, fittings, &c., amounting to close upon £2000, was included in the award. The transfer is the result of an agreement to sell and purchase effected between the two bodies on June 16, 1902; the consideration for the sale being "the payment by the Council to the Company or its Liquidator . . . of the sum which should be ascertained to be the market value of the undertaking." The agreement was conditional on a Provisional Order being obtained by the Council. The Order was duly made and confirmed by the Local Government Board (Ireland) Provisional Orders Confirmation (Gas) Act, 1902. The Council appointed Mr. Joseph Hepworth as their Arbitrator, and the Company Mr. Corbet Woodall; and they, in turn, appointed Mr. W. F. Cotton to be Umpire. Mr. Hepworth and Mr. Woodall were unable to agree upon a joint award; but in Mr. Woodall's conclusion the Umpire concurred. The Council formally took control of the works on April 1; the Company having worked them up to that time from Dec. 31 on behalf of the Council. The Manager of the works is Mr. William Nisbet.

A CURIOUS TALE OF FINANCIAL PRODIGALITY.

The Association of the Welsbach and Austrian Companies.

In the course of the proceedings at the recent meeting of the Welsbach Company, the story was told of the whole connection of the English concern with the Austrian Company. It was unfolded in a carefully prepared statement, which was read by the Secretary (Mr. W. Resbury Few). The shareholders listened to it in gloomy wonderment; for it laid open to them one of the capacious channels through which a large part of their lost capital has passed. Cries of "Shame!" interspersed the reading; and at that no one can be amazed. After perusing the portions of the statement which are reproduced below, readers will not be surprised that the proprietors are now more than ever thankful that they effected a change in the management of their affairs some twelve months or so ago. The principal parts of the statement are as follows.

The Welsbach Company [as at present constituted] was formed in December, 1897; one of its objects, as stated in the prospectus, being to acquire, as owner of the great bulk of the shares of the Vienna Company, control of that business. The capital of the Austrian Company at that time amounted to 1,500,000 florins—say, £120,000—made up of 1500 shares of 1000 florins (say £80) each. The Welsbach Company acquired 1257 of these shares; capital being reserved for the acquisition of the remaining 243 shares. Of these 243 shares, 174 were subsequently acquired at a cost of £159,591; making the holding of the Welsbach Company 1431 shares out of a total of 1500. The cost of these 1431 shares was, according to the books, £1,450,000, or an average of over £1000 each—equal to twelve times the total capital of the Austrian Company!

Baron Auer appears to have held at the date of the purchase 25 shares, which 25 shares by some peculiar arrangement carried the voting power appertaining to his former holding of 800 shares; thus giving him the control of the voting power of the Company. In order to specifically obtain this controlling vote for the Welsbach Company, the Reconstruction Guarantee Company contracted to pay Baron Auer £1000 each for his 25 shares, and £50,000 for the voting power—£75,000 in all, equal to £3000 per share!

The prospectus of the Welsbach Company was dated Dec. 11, 1897; and immediately after this, and before the money was actually paid over, proposals were made by Baron Auer to the Welsbach Company for the sale of his electrical patents for Europe. These proposals resulted in the agreement, dated March, 1898 (say, three months after the Welsbach Company came into existence), under which agreement Baron Auer regained the voting power and the control of the whole Austrian Company. Under this contract Baron Auer transferred to the Austrian Company his European patents for the osmium lamp, and received in payment 2000 shares of 1000 florins each (£80), which, if calculated upon the basis of the cost to the Welsbach Company of the 1431 shares, represents a payment equal to about £2,000,000. It was also agreed that the moneys required for the exploitation and development of these electrical patents should be advanced by the Austrian Company at 4 per cent. interest; and such advances were to be repaid out of the first profits made by the sale of patents in Europe. There does not appear in the contract any special mention of what was to happen in the event of the monies so advanced being lost; but it is quite clear that the whole of such loss would have fallen upon the holders of the original shares—namely, ourselves.

In return for this advance the original shareholders were to receive three-sevenths, not of the profits, but of the divisable profits arising from the sale or working of the electrical patents. Before any profits were divisable, however, the Austrian Board had the power to write off as depreciation on the value of patents 3,500,000 florins (£280,000), a sum equal to the whole of the capital of the gas undertaking and of the proposed further electrical company. Then 10 per cent. of the profits were to be devoted to the formation of a reserve fund for any losses which might occur in the future, until this fund had reached the sum of 500,000 florins (£40,000). The members of the Board were then entitled to remuneration at the rate of 3000 florins (£240) each. The general meeting then had power to pass a resolution that the

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GAS COOKERS.

MODERN
IN
EVERY
RESPECT.

John Wright & Co., Essex Works, Birmingham.

remaining net profit should be applied wholly or partly for the purpose of supplying the electrical undertaking with working capital to the extent of a further 2,000,000 florins (£160,000). The remaining balance of net profit was next to be divided in the proportions of four-sevenths to the holders of the 2000 new shares to be created and vested in Baron Auer, and three sevenths to the holders of the original shares. But there was a proviso that it should be in the power of the general meeting to dispose otherwise of the sum available for dividend. It will be seen, under these powers, that after the repayment of any advances there might be owing to the gas undertaking by the electrical undertaking, it would be possible (the majority of the voting power being in other hands) to set aside about £500,000 of the profits of the electrical undertaking—if they ever reach such a sum—before this Company would be entitled to participate.

In order to give effect to this agreement of March, 1898, the title of the Austrian Company was altered; and the capital was increased from 1,500,000 florins to 3,500,000 florins, divided into 1500 "A" shares (gas undertaking) and 2000 "B" shares (electrical undertaking); the latter being allotted to and held by Baron Auer. None of these "B" shares were allotted to the holders of "A" shares, although one would have expected to find three-sevenths of them so allotted. New statutes (Articles of Association) were prepared, under which the Board of Directors was to consist of at least five, and at most nine, members; two to be nominated by the "A" shareholders, and the remainder jointly by the "A" and "B" shareholders. The effect of this is, and has been, that you have had only two representatives on the Board, and can be out-voted at Board meetings, as well as at general meetings.

Under these new statutes, it was provided that undertaking "A" was to grant to the electrical undertaking a loan up to a maximum amount of 1,100,000 florins (say, £90,000). In the years 1898-1900 advances were made by "A" to "B" amounting in all to about 900,000 kroner (£36,000), which sum was afterwards repaid with interest at 4 per cent. out of the proceeds of the sale of the French and German osmium patents. The balance of the purchase money from these sources was not divided, but applied to the reduction of the cost of patents. No further profits have been made by "B," but large expenses have been incurred. We [the Directors] are informed that the cash resources of "B" have now been exhausted, and regret to say that recently the borrowings from "A" have recommenced. Immediately after the last general meeting of this Company, your Chairman and Vice-Chairman went to Vienna, with the object of discussing the position with the Austrian Directors. They especially desired to meet Baron Auer, who himself fixed Aug. 12 as the date of the meeting; but, after their arrival in Vienna, they were informed that Baron Auer was unable to attend. They discussed with the other members of the Board certain desirable changes in the administration of the business, with a view of effecting important savings, which, in their opinion, were desirable in the interests of the Welsbach Company. The members of the Austrian Board unanimously agreed to their proposals; and they considered the matter settled. Shortly afterwards, they were advised that Baron Auer, exercising his powers as President of the Austrian Company, declined to accede to their proposals; and they could not therefore be carried through. There appears to be an impression amongst certain stockholders that the Welsbach Company acquired the right to all Baron Auer's future inventions without further payment. This is not the case; and as far as this Board are able to trace, all that was acquired was "an option to purchase on terms to be agreed"—an option which it is obvious is no option at all, and perfectly valueless. The Austrian Directors contend (which is not admitted) that, under the statutes, they have power to resume borrowings from "A," and, despite the objection of this Board and the vote of this Company's representatives on the Austrian Board, as lately as March last, a sum 100,000 kroner was voted by the majority from the resources of "A" in aid of the deficiences on the working of "B."

In February last, Baron Auer telegraphed asking if this Board were prepared to sell your Austrian shares. They replied asking what offer he was prepared to make for them, and received in reply an invitation to attend a conference at his house in Vienna the following week. Accordingly your Chairman and Managing Director [Mr. K. H. Buchanan] attended, when Baron Auer offered 1500 florins (say £120) per share for the whole of our shares in the Austrian Company. He contended that this was their full value, and would not increase his offer. As the acceptance of this offer could not be recommended, they proceeded to consider the possibility of arriving at an agreement for the separation of the two undertakings, with a view to obtaining control of your own business—the "A" undertaking. . . . At the meeting in Vienna, after protracted negotiations, terms of separation were eventually agreed, subject to your approval and of the approval of the shareholders in the Austrian Company, on the following lines—viz., that Baron Auer should take over the whole of the assets and liabilities of the "B" undertaking, and should repay his debt to the Company (which debt has since been repaid), amounting to about 300,000 kronen (say, £20,000), borrowed during the past few years; that he should give the Company, in consideration of the money advanced in the past and for the risks run, an interest of 15 per cent. in the profits of the "B" undertaking during the life of the osmium patents—say, about twelve years; that he should further have the option of commuting this 15 per cent. interest at any time during the currency of the agreement by a cash payment of £30,000, in addition to any profits that might have been received, the profits to be dealt with upon a proper business basis, and not to be subject to the absurd provisions for reserves at present existing; that the statutes should be altered; that all obligations of "A" to contribute funds to "B" and otherwise should be cancelled, and all obligations of "B" to "A" contained in the statutes should also be cancelled. . . . Shortly after the return to England of the Chairman and Managing Director, a telegram was received to the effect that Baron Auer repudiated in their entirety the terms agreed, and submitted a new proposal, which he called an "ultimatum," the terms of which so materially

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PURIFIERS & VALVES

(PICKERING'S PATENT).

INCLINED RETORTS

(DIDIER SYSTEM).

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differed from the above agreement that they could not be entertained. The view of this was, and is, that the arrangement arrived at should be carried out.

As to the value of the osmium lamp and the supply of osmium, repeated announcements have been made during the past five years that ample supplies of osmium were forthcoming; that every difficulty had been removed; and that the lamp was now a commercial success. A similar statement has recently been made, and also a statement that all difficulties of voltage have been overcome. It will, however, be seen that, even if these later statements should prove to be more accurate than the earlier one, there is, by reason of the constitution of the "B" undertaking, to which attention has been called, little or no possibility of the "A" shareholders receiving any of the profit, while since March, 1898, you, the "A" shareholders, have been running the entire risk of providing funds for the experiments and outlay of the "B" undertaking, in which you are not shareholders, but are only entitled to three-sevenths of the divisible profits.

Further, since the issue of the report and accounts of this Company, a copy of the balance-sheet and profit and loss account of the Austrian Company have been received from Vienna. These accounts have not yet been audited, but may be taken as being substantially correct. The profit on the "A" undertaking is shown at £56,480, from which is deducted the loss on "B," amounting to £11,170—leaving a net balance of £45,310, which compares with a net balance of £53,594 for the previous year—a decrease of £8000. Expenses—that is salaries, rents, &c.—have increased by over £7000. This increase must be in connection with "B," as the expenses of "A" have decreased. The gross trading profit of the gas undertaking shows an increase of about £1000; and as its expenses have decreased, the result for the past year would have been fairly satisfactory but for this heavy loss on the working of "B." The dividend suggested is 30 per cent., against 40 per cent. last year. This would yield on 1431 shares about £36,000. Last year the dividend received on the same number of shares was £47,558. It would appear from these accounts that there is great danger in forthcoming years of any profit that may be made on "A" being absorbed by the losses of "B," and of the investments representing the reserve fund of "A," which have been drawn upon during the past year, being further depleted by borrowings of "B."

As stated in our report (published last week) of the proceedings at the meeting of the Welsbach Company, a resolution was passed authorising the Board to take all the steps that, in their judgment, they consider necessary to secure the separation of the "A" and "B" undertakings of the Austrian Company, and to restore the control of the "A" gas undertaking to the "A" shareholders alone.

An exhibition of the cooking and heating appliances of Messrs. R. & A. Main, Limited, was opened in Gilfillan Hall, Dundee, on Tuesday last, by Lord Provost Barrie. Miss Dodds is the lecturer.

FREE INCANDESCENT MANTLES.

An interesting offer has recently been made to consumers by the Christchurch (N.Z.) Gas Company, with a view to extending the use of incandescent gas lighting, and assisting those who adopt it to obtain the best results. A circular was a short time since issued by the Company in which they stated their willingness, on and after March 1, to replace whenever necessary, free of charge, "any mantle becoming useless through fair usage, and after having been in use 500 hours, whereby at least 2000 feet of gas has been consumed." They, however, point out that, with fair usage, a Welsbach mantle will last 1000 hours, or during the time 4000 cubic feet of gas is being consumed, though it may happen, from causes beyond the consumer's control, that the life of the mantle is shortened. It is in view of the latter contingency that the offer referred to is made; and the Company state that they rely upon the co-operation of consumers to enable the concession to be continued. They reserve to themselves the right, in all cases, to decide the point of "fair usage," and from time to time to alter or annul any or all of the conditions with respect to the free replacement of mantles.

GROWTH OF THE GAS BUSINESS IN AMERICA.

Mr. F. H. Shelton, of Philadelphia, calls our attention to a letter addressed to the "American Gaslight Journal," which shows that some of the towns in the States are beginning to do as large a business as those in England, though they have hitherto always been far behind us in the output per head. He instances the small town of Media (Pa.), where the increase of business has been very marked during the past year. Media is a residential town of 3500 people, 14 miles from Philadelphia. It has had a gas service for twenty years. The old rate was $1·50; since reduced to $1·25. A year ago, the Company was purchased by the Suburban Gas Company of Philadelphia, and consolidated into their system, though a local office is still maintained, and the business done is recorded separately from the other districts operated by the Company. On April 1, 1902, there were 301 meters, which number during the year was raised to 606. The services increased from 301 to 612, gas-ranges from 60 to 297, gas-engines from 3 to 5, water-heaters from 10 to 105, and other appliances in like proportion. In addition to this, 38 lamp-posts have been installed where none existed previously; and 41 "arc lamps" of the outside pattern and 130 for inside use were fitted up. The old management sold 4,577,400 cubic feet of gas; while in the past year this figure grew to 12,260,900 feet. A portion of this was accounted for by extensions or new mains; but the amount sold on the old mains was 2¼ times that of the previous year. This excellent result is due primarily to the right policy of the management, to the energy displayed by the Superintendent in charge of the Media branch (Mr. W. H. Yocum), and to the

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oversight of the General Local Manager (Mr. J. D. Shattuck). The gas comes under some 30 lbs. pressure from the city of Chester, by a roundabout course of 6, 4, and 3 inch pipes, some 7 or 8 miles. It would thus appear, says the writer, that the loss of candle power from compression—one of the bogies alleged against the desirability of high-pressure work—does not make much difference in the efficiency of the gas, or in its sales at the far end. The gas made in Chester is 22-candle power water gas; but there is no photometer in Media—the readings of the consumers' ledger being to the management sufficiently satisfactory.

ELECTRIC LIGHTING NOTES.

Refusal to Sanction a Loan at Dungannon.

As the result of the Local Government Board inquiry held last February in Dungannon, as to the proposed electric lighting scheme put forward by the Urban District Council, intimation has been received to the effect that the Board cannot sanction the loan applied for. The scheme therefore falls through; and the members of the Council, who were unanimously in favour of the project, are said to feel much aggrieved at this decision, considering that a large sum was spent in promoting the undertaking.

Gas v. Electricity in Bermondsey.

The Housing Committee of the Bermondsey Borough Council reported last Tuesday that they had considered a suggestion from the Electric Lighting Committee that the electric light be installed in the working-men's dwellings erected by the Council in Rotherhithe. A letter had also been received from the South Metropolitan Gas Company offering to lay the necessary gas pipes and fittings and put in penny-in-the slot meters free of expense, provided the electric light was not installed in the buildings. The Committee recommended that the Company's offer be accepted. Mr. Cox pointed out that the electric light had been put in municipal working-men's dwellings at Shoreditch, with satisfactory results. Other speakers said gas would afford heat as well as light, which was a consideration for poor people. The electric light was also very costly. The recommendation was carried *nem. con.*

A "Noble" Result at Torquay.

A return was presented to the Torquay Town Council last week as to the work of the electric lighting undertaking for the five years in which it has been in operation. In the first year there was a loss of £1179; in the second, a loss of £298; in the third, a loss of £832; in the fourth, a profit of £1558; and in the last, a profit of £313. Allowing for £200 placed to reserve fund and the value of the stock on hand (£274), the works show a profit of £36 14s. 6d. on the five years' working. The revenue from private consumers in each of the five years was £597, £2144, £2922, £4336, and £4578. With regard to public lighting, the Electricity Department received £1204 in the first year, £1053 in the second, £1310 in the third, £978 in the fourth (nine months only), and £1243 in the fifth. The cost of gas for public lighting in the meantime was £1775, £1562, £1695, £2626, and £2651. Mr. F. J. Crocker said that the return did not look so favourable as it really was. If the works had been in the hands of a company, and the money paid for interest and sinking fund had been taken into account, they would have paid a dividend of 4 per cent., and still have had a considerable reserve. Mr. Pike remarked that the Corporation had not made the same allowance for depreciation that a company would have done; so that the question of profit would have been about the same either way.

A Charge for Unused Current.

The Poplar Borough Council, with regard to their electric lighting undertaking, seem to be behaving in a way that will make them anything but a popular borough council. Only last week, a baker and confectioner was summoned by them at the Thames Police Court for neglecting to pay £1 8s. 9d. due to them "on account of electricity they had supplied." It was in vain that the defendant pleaded he did not owe the money, and that they could not make a man pay for what he had not had. The Magistrate (Mr. Dickinson) replied that he was sorry to say they could. It appeared that in 1900 defendant signed a contract to take electricity, at a minimum charge of 20 units a quarter, though he denied having agreed to the latter stipulation at the time the wiring was done. The Council, he said, put in such defective fittings that he was unable to use the electricity, and on one occasion it almost burnt his place down. It was not nearly equal to gas in power; and he had been charged for three quarters when he had not been using the light. The collector pointed out that they had offered to disconnect defendant if he gave notice in writing; but as he had not done this, he had been charged a quarter during which he had not used the light. In view of this admission, it seems curious that the Council should have summoned the man for neglecting to pay for "electricity they had supplied." There was no escape, however, and the Magistrate had to make an order for the amount claimed, with 3s. costs, remarking, at the same time, that he thought it strange the Council should not show common sense, and draw up a simple contract. He might have added that it is also strange that they can find people foolish enough to bind themselves in the way the defendant had done. It is to be hoped the case will prove a salutary warning to would-be consumers at all events, and that they will manifest a greater desire to "look before they leap" than did the man whose unhappy experience it is our duty to chronicle.

The interesting display of the Keith light at the Cologne Exhibition has gained a gold medal for the James Keith and Blackman Company, Limited. This system of gas-lighting appears to be doing well in Germany and other parts of the Continent.

BRADDOCK'S NEW PATENT

GAS STATION GOVERNOR

THE BEST GOVERNOR OBTAINABLE.

Most compact and convenient.

Unsurpassed for Durability,

Efficiency, and Reliability.

OVER 80 (4 in. to 36 in. inclusive) SUPPLIED.

Full Particulars, Illustrated Sheets, &c., free by post upon application.

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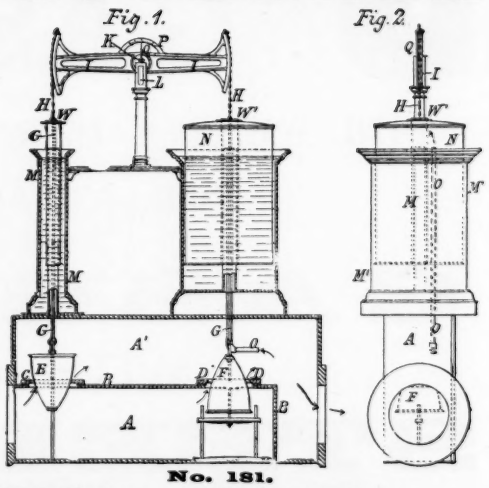

No. 181.

BRADDOCK'S PATENT "SELF-LOADING" APPARATUS

The outlet pressure is automatically and gradually varied, within any predetermined and fixed limits, according to the demand for gas being small or large.

First Cost soon saved. A proved success. Repeat Orders received.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, OLDHAM,

AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E.

Telegrams: "BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

METROPOLITAN WATER BOARD.

The members of the Board met at the offices of the Metropolitan Asylums Board, on the Thames Embankment, last Friday—Mr. R. M. Beachcroft in the chair. The first business to come before them was the appointment of a Vice-Chairman. Mr. Whiter said he thought the Board would be making a very great mistake if they selected men for important positions until they knew who were most fitted to fill them. He was convinced that it would be wrong to appoint a Vice-Chairman too quickly; and he moved that the consideration of the subject should be deferred for three months. Mr. Lidiard seconded the motion. Mr. Elliott moved, as an amendment, that the appointment should be postponed until after the summer; and this was accepted by the proposer, and eventually agreed to. The report of the Finance Committee was next considered. It set forth that the Committee had ascertained that the Bank of England were prepared to open a drawing account in the name of the Board, and, when the time arrived, to undertake the issue and management of the Metropolitan water stock. They were also prepared to make advances up to £5000 for immediate incidental expenses. The Committee recommended that application should be made for the amount named, and that the Chief Cashier of the Bank should, for the present, be Treasurer of the Board. The report was adopted. The attention of the Committee having been called to the resolution of the Board on the subject of the examination of water by the London County Council, on behalf, and at the cost, of the Board, they reported that they estimated the expense of such examination would be £351 for 13 weeks. The estimate was approved. The report of the General Purposes Committee was next presented by the Chairman (Mr. H. Clarke), who proposed its reception. It dealt mainly with the question of a meeting-place; and the Committee reported in favour of the Caxton Hall, Westminster, as being in close proximity to the professional assistance which the Board would require. The report was adopted. Mr. H. P. Harris brought up a report by the Law and Parliamentary Committee, stating that they had appointed a Sub-Committee to advise them on the subject of the conduct of the arbitrations in connection with the acquisition of the Water Companies' undertakings. It was constituted as follows: Mr. C. E. Baker, Mr. R. M. Beachcroft, Mr. I. H. Benn, Mr. W. H. Dickinson, Mr. H. P. Harris, Mr. J. Lidiard, Mr. C. G. Musgrave, Mr. E. H. Pickersgill, Mr. J. Thornley, and Mr. T. M'Kinnon Wood. Mr. E. B. Barnard's name was afterwards placed on the list in consequence of the appointment of Mr. Beachcroft as Chairman of the Board.

The Treasurer to the Bury and District Joint Water Board (which represents Bury, Rawtenstall, Haslingden, Radcliffe, Ramsbottom, Whitefield, Tottington, Prestwich, and Little Lever) reports that the loss on the past year's working amounts to £5397.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

It is positively refreshing to find a good word being spoken at a Town Council meeting regarding the quality of the gas supplied to the town. Such an event actually took place at a meeting of the Dundee Town Council on Thursday, when Mr. G. Stevenson said he was pleased to see from the Gas Manager's report that they were now being supplied with gas of 22-candle power and of the utmost purity. They never had gas so pure. The carbonic acid had been greatly reduced; and he thought they had every reason to be proud of the purity of their gas, whatever the Treasurer might have to say about the price of it. The remark was appreciatively received, which may be taken as an indication that gas matters in Dundee are in a healthy condition.

In Broughty Ferry there is not so much cordiality. The Corporation are at present applying to the Secretary for Scotland for an increase of their borrowing powers, to the amount of £25,000, which is required partly on account of the recent outlay at the gas-works. A town councillor who is described as a keen critic of the Gas Commissioners' policy and financial position has, it is stated, addressed a letter to the Secretary for Scotland, giving his views as to what he considers the real cause of the large expenditure at the gas-works, and asking whether, in certain circumstances, members of the Council would be held responsible for any debt in excess of the borrowing powers. This is not keen criticism; it is rather destructive criticism. The councillor may be certain that, in the event of the gas undertaking getting into a state of insolvency, he would be required to pay his share of the deficit, no matter though he should have been out of the Council for many years; but he may be just as certain that there is not the slightest probability of such a contingency ever arising. Before that time, there would be so much disaster in other lines of industry that the failure of the gas undertaking would be comparatively a small matter. A deputation of the Town Council are at present in London with the object of interviewing the Secretary for Scotland upon the subject, he having asked for more information.

The other day a family of the name of M'Lean were poisoned by gas in the small town of Beavie, in Kincardineshire, happily without fatal result. On search being made, it was found that a 4-inch gas-pipe was snapped in twain, and that the gas was issuing from the fracture with a hissing sound which could be heard about ten yards away. The escaping gas got into a disused built sewer, and thence into the basement of the house, which was made-up earth. About ten days before the occurrence, a road traction-engine and two heavily laden waggons passed through the place; and the wheels of one of the waggons sank into the roadway just at the spot where the gas-main was broken.

A Parliamentary Committee is at present sitting in Glasgow, making

7½%

per annum,

To keep our Coke-Conveyors in THOROUGH WORKING ORDER, is what we will charge. This is not what it costs; but as it is lower than the actual cost on other designs of Hot-Coke Conveyors, you may be glad to accept our offer. We shall be glad if you do.

We have no need now to Advertise our . . . Inclined Retorts in the "JOURNAL." They advertise themselves.

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100%

is the EFFICIENCY of our Coke-Conveyor. We guarantee it to do certain work that is specified, and it does it. Not 75 per cent. or 200 per cent. It does all we say and no more. It does not break the Coke. It does not break down. Twenty-five hours' stop in Twelve Months working!

inquiry, under the Private Legislation Procedure (Scotland) Act, into several applications for Provisional Orders. The one under consideration at the end of this week is by the Corporation of Glasgow, who seek powers to complete the scheme for the purification of the sewage of the city and to alter the incidence of taxation for public lighting. The hearing was begun on Wednesday, the portion taken up being that relating to the sewage. Under the portion referring to lighting, it is necessary to explain that at present the Corporation authorize the owners of tenements in which there are common stairs to charge the occupiers 10s. a year per burner for the cost of lighting them, which amount is handed over to the Corporation, less 20 per cent. which is allowed to be retained as remuneration for collection; and the Corporation charge the owners of properties in private streets 15s. per lamp for lighting them. It is proposed to abolish these charges, and to impose a direct assessment for lighting purposes upon the whole of the ratepayers of the city, payable equally by owners and occupiers. The Corporation made similar proposals in 1901; but their application was not granted.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 9.

Sulphate of Ammonia.

The hopes based upon renewed demand in April having been disappointed, and makers having stocks to carry over, the present week opened with a depressed market and an anxiety at all points to sell. £12 15s. was subsequently accepted at Liverpool, Glasgow, and Hull, both by makers and resellers. Buyers had, however, also been waiting, and, readily availing themselves of the decline, there has at the close been some recovery in values, the closing quotations being £12 15s. per ton f.o.b. Hull, and £12 17s. 6d. per ton f.o.b. Leith and Liverpool. In the forward position makers for the most part maintain a firm attitude, and the nominal value of July-December is £12 10s. per ton, but the equivalent of this price is not obtainable abroad, there being speculative sellers at less, and a certain amount of business being reported done.

Nitrate of Soda.

This article is steady at 9s. 6d. for ordinary and 9s. 9d. for refined quality.

LONDON, *May* 9.

Tar Products.

There is very little fresh to advise. The demand for pitch continues very good from South Wales, for both prompt and forward delivery; but Continental buyers are perfectly indifferent, and are not inclined to purchase at present. 90 per cent. benzol is now offering at 9d. for prompt delivery; but consumers are not interested in the article at present, while in 50 90 per cent. there is absolutely no business doing. In solvent, some small contracts are reported to have been made for home consumption at from 7½d. to 8d. for special qualities; but there is no demand for export. The position of toluol is unchanged. There is nothing doing in the article. Crude carbolic remains firm. Further business has been done for May-June at 1s. 6½d., while for July-December there are still buyers at 1s. 7d.; but makers will not entertain this price. As regards crystals, there is an entire absence of business so far as the English producers are concerned. Creosote is decidedly quiet; and lower prices are being accepted by the London makers for home consumption. In anthracene, there is a little business doing at 1⅜d. per unit for "A" 40 per cent. early delivery; but manufacturers decline to offer forward, except at considerably higher prices. In crude naphthalene there is more inquiry for forward delivery; but for prompt there is really no demand.

The average values during the week were: Tar, 21s. 6d. to 28s. Pitch London, 57s. to 57s. 6d.; east coast, 54s.; west coast, 52s. 6d. to 53s. Benzol, 90 per cent., 8½d. to 9d.; 50-90 per cent., 7d. to 7½d. Toluol, 7d. to 7¼d. Crude naphtha, 3d.; solvent naphtha, 7d. to 8d.; heavy naphtha, 8d. to 9d. Creosote, London, 1½d.; North, 1⅜d. to 1½d. Heavy oils, 2d. to 2 1/16d. Carbolic acid, 60 per cent., 1s. 6½d. to 1s. 7d. Naphthalene, 30s. to 45s.; salts, 21s. 6d. to 23s. 6d. Anthracene, "A" quality, 1⅜d. to 1½d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market remains very quiet; and there is really no business doing. Beckton quote £13 for June, but do not care to offer forward at present. There are, however, sellers on Beckton terms at £12 15s. for prompt delivery, without finding buyers. In Leith, the market was very dull early in the week, and business was reported at £12 15s. There was, however, more inquiry at the close, and some makers advise having done business at £13 for prompt shipment. In Hull, there is not very much offering for prompt shipment. Makers ask £12 17s. 6d. for June; but buyers will not entertain business at this price. In Liverpool, small sales have been made at £13 for prompt shipment; but there is nothing doing for forward delivery. The market generally is quiet, although there is now more demand than prevailed at the beginning of the week.

The annual meeting of the shareholders in Meldrum Bros., Limited, was held on the 30th ult. at Timperley, near Manchester. The accounts showed that, after paying the usual dividend of 5½ per cent. on the preference shares and writing £1000 off goodwill and patents, there remained a sufficient sum to allow of a dividend of 8 per cent. on the ordinary shares and leave a carry-forward of £2542. Subsequently, the preference shareholders, at a special meeting, sanctioned the issue of an additional 25,000 cumulative preference shares, ranking *parri passu* with the existing ones. The shareholders inspected the new works, and expressed great satisfaction with the completeness of all the arrangements and appliances.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

PREVENTS NAPHTHALENE DEPOSITS.

OVER 100 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Seven Years.

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

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THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

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COAL TRADE REPORTS.

Lancashire Coal Trade.

The decision of Lord James of Hereford, by which the miners' rate of wages has to remain unchanged, may possibly tend towards some steadying of prices, where, previously, in anticipation of some possible reduction in wages, collieries were prepared with small concessions to secure orders. The reduction in house-fire coal prices has brought forward some increased business in the various descriptions of fuel used for domestic purposes. The extra orders coming forward have, however, not been due to any increase of actual requirements, but rather to the fact that buyers had been holding back for lower prices. Consequently, collieries are not anticipating a continuance of the present demand, and in most cases are looking forward to the possibility that before long pits will have to go on to about three to four days per week. Prices are steady at the reduced rates, averaging 14s. to 14s. 6d. per ton at the pit for best Wigan Arley, 11s. 6d. to 12s. for seconds Arley and Pemberton four-feet, and about 10s. to 10s. 6d. for common house-fire coals. There is the probability that no further material change will take place on present current rates. With regard to the lower descriptions of round coal, one or two important contracts for gas coal have been settled during the past week; but the prices have not transpired. Judging from the statements of representatives of collieries, however, it would not seem at all likely there has been any appreciable giving way upon last year's rates—concessions of 3d. per ton being the outside figure talked of. At the pit-mouth, ordinary qualities of steam and forge coal are not quoted under 8s. 6d. to 8s. 9d. per ton, with the better sorts in some cases fetching 8s. 9d. to 9s. 3d. The shipping trade remains unsatisfactory, and prices still rule low. Common steam coals are obtainable at about 9s. 3d. to 9s. 6d. per ton, with better qualities quoted at 9s. 6d. to 10s. delivered at the ports on the Mersey. The better sorts of engine fuel are still rather short to meet requirements, and prices are strong at 6s. 9d. to 7s. 3d. per ton; at the pit, medium qualities are 5s. 9d. to 6s. 3d., and common slack from 4s. 6d. up to 4s. 9d. and 5s. 3d.

Northern Coal Trade.

There has been general activity in the coal trade of the North, but without any exceptional briskness. The demand is setting steadily in from the Baltic; and this will give full work for some time to many of the collieries, both those producing steam and gas coals. In the steam coal trade, the demand is now fairly good, more especially for the best classes of fuel; so that the prices of these are well maintained at about 10s. 9d. per ton f.o.b. Second-class steams are quiet at about 9s, and steam smalls are 5s. 6d. to 5s. 9d.—the latter class being steady. In the gas coal trade, the great contracts for the Metropolis are now being settled; and it seems probable that the average price will be very little above 8s. per ton f.o.b. for Durham gas coals—about 9d. per ton less than last year's rates. Occasional cargoes of gas coals are quoted from 8s. 3d. to 9s. per ton f.o.b., according to quality; but sales do not seem to be frequent, and the contracts still take up a large part of the output. The limited production of gas coke keeps the price much as of late weeks—the quotation for good sorts being from 12s. 3d. to 12s. 6d. per ton f.o.b.

Scotch Coal Trade.

The action of the engineers in the Clyde district in coming out on strike in so unexpected a manner renders it difficult to take a general estimate of the coal trade, which, of course, is one of the first to be dislocated by the cessation of work. The present effect is, of course, to make coal plentiful, and therefore cheaper. Trade is reported to be quieter; and the prices quoted on the Glasgow Stock Exchange last week were: Main 8s. to 8s. 3d. per ton f.o.b., ell 9s. to 10s., and splint 9s. 3d. to 9s. 6d. The shipments for the week were 208,469 tons—a decrease of 63 tons and of 16,330 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,209,912 tons—an increase of 52,117 tons upon the same period of last year.

Among recent orders received by Messrs. Joseph Taylor and Co., of Bolton, for ammonia saturators may be mentioned those from the Malvern and Skipton Urban District Councils.

The Directors of the Oriental Gas Company, Limited, have resolved to pay an interim dividend at the rate of 3½ per cent., free of income-tax, on account of the twelve months ending the 30th prox.

The Directors of the Grand Junction Water-Works Company have decided, subject to audit, to recommend the payment of a dividend for the half year ending the 31st of March at the rates of 10 per cent. per annum on the £50 "A" and £25 "B" shares, 7½ per cent. on the £25 "C" shares, and 7 per cent. on the £50 "D" shares.

The Market Rasen Water Company have secured the services of Mr. E J. Silcock, M.Inst.C.E., F.G.S., of Leeds, to advise them as to the best means of improving the supply of water for their district; and the same gentleman has been consulted by the Caistor Rural District Council with reference to the water supply of Nettleton and Moortown.

According to the report of the Directors of Meters Limited on the working of the undertaking in the twelve months ending the 31st of March, there is a gross profit of £40,372, and a net profit of £27,933. Interim dividends at the rates of 5½ and 5 per cent. per annum upon the preference and ordinary shares were paid in November last; and the Directors recommend the payment of further dividends at the rates of 5½ and 7 per cent. per annum upon the two classes, making the ordinary dividend 6 per cent. for the year. They also advise that £11,000 should be added to the reserve fund, and that the balance of £2721 should be carried forward.

Having been before the gas profession for thirty years, the "Plutonic" cement introduced by Mr. William Richardson has a well-established reputation. The "Plutonic" Cement Company nevertheless find it necessary to warn gas engineers and managers against the numerous imitations of their speciality which have of late years been introduced, especially from abroad. This they do in the preface to the seventh edition of their pamphlet on the nature and various applications of this cement, which has lately been issued. Appended to the special information furnished in the text are a number of useful tables, blank forms for recording working results, &c.

THE POSITIVE PREPAYMENT

IS PRE-EMINENT.

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SAWER & PURVES,

MANCHESTER.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

CARBONIZING FOREMAN. Coventry Gas-Works.
FITTER AND MAIN AND SERVICE LAYER. Dorking Gas Company.
FOREMAN AT TAR WORKS. Halifax Corporation Tar Works. May 18.
FOREMAN DISTRIBUTION DEPARTMENT. Cleethorpes Gas-Works.
MANAGER FOR COMPRESSED GAS-WORKS. No. 4031.
MANAGER GAS FITTING, &c., COMPANY. No. 4030.
METER REPAIRER. Cape Town Gas Company.
PIPE LAYER, &c. Brentwood Gas Company.
STILLMEN. Halifax Corporation Tar Works. May 18.
WORKING FOREMAN. Broughty Ferry Gas Department.
WORKING MANAGER. No. 4027.

Situations Wanted.

CHEMIST, &c. Chemist, Ipswich.
MANAGER OR DISTRIBUTION SUPERINTENDENT. No. 4025.
OUTSIDE SUPERINTENDENT, &c. Silms, Catford.
TRAVELLER GAS ENGINEERING FIRM. No. 4032.
TRAVELLER GAS-STOVE TRADE. W. W. Faversham.
WORKS CLERK. C. B., Watford, Herts.

Gas-Works for Sale. No. 4026.

Plant, &c., for Sale.

METERS (2 and 3 light wet). Blackburn Gas Department.
PURIFIERS, &c. Nantwich Gas-Works.
SCRUBBER, WASHER, STATION METER, EXHAUSTER, TANKS, CONDENSERS, MOUTHPIECES, LANTERNS, &c. Longwood Gas Company.

Sales of Stocks and Shares.

CHIGWELL, LOUGHTON, &c., GAS COMPANY. May 26.
EAST LONDON WATER COMPANY. May 26.
GORING AND STREATLEY GAS AND WATER COMPANY. May 18.
LOWESTOFT WATER AND GAS COMPANY. May 25.
SOUTHEND GAS COMPANY. May 26.
WAKEFIELD GASLIGHT COMPANY. June 8.

TENDERS FOR

Ammoniacal Liquor.
LONDON COUNTY ASYLUM, BANSTEAD. Tenders by May 14.
MANSFIELD GAS DEPARTMENT. Tenders by May 26.
ROTHERHAM GAS DEPARTMENT. Tenders by May 19

Benzol and Benzolized Creosote.
WALSALL GAS DEPARTMENT. Tenders by May 30.

Bricks and Flags.
LEEDS GAS DEPARTMENT. Tenders by May 25.

Coal and Cannel.
BALLYMENA GAS DEPARTMENT. Tenders by May 29.
BURTON-ON-TRENT GAS DEPARTMENT. Tenders by May 20.
DENBIGH GAS COMPANY. Tenders by May 25.
DOWNHAM MARKET GAS COMPANY. Tenders by May 23.
DRONFIELD GAS COMPANY. Tenders by May 29.
GLOUCESTER GAS COMPANY. Tenders by June 1.
LEICESTER GAS DEPARTMENT. Tenders by May 31.
LURGAN GAS COMPANY. Tenders by June 1.
MANSFIELD GAS DEPARTMENT. Tenders by May 26.
MILTON-NEXT-SITTINGBOURNE GAS DEPARTMENT. Tenders by May 23.
MORLEY GAS DEPARTMENT. Tenders by May 16.
NEWPORT (MON.) GAS COMPANY. Tenders by May 25.
RICKMANSWORTH GAS COMPANY. Tenders by May 28.
SOUTH STAFFORDSHIRE WATER COMPANY. Tenders by May 18.
SOWERBY BRIDGE GAS DEPARTMENT. Tenders by May 25.
STOCKTON GAS DEPARTMENT. Tenders by May 21.
SUTTON, SOUTHCOATES, &c., GAS COMPANY. Tenders by May 26.
TIPTON GAS DEPARTMENT. Tenders by May 16.
TIVERTON GAS DEPARTMENT. Tenders by June 1.
ULVERSTON GAS DEPARTMENT. Tenders by May 28.
WALSALL GAS DEPARTMENT. Tenders by May 30.
WARE GAS COMPANY. Tenders by June 1.
WESTERHAM GAS COMPANY. Tenders by May 27.

Fire-Clay Goods.
WARRINGTON GAS DEPARTMENT. Tenders by May 22.

Gasholder Tank.
CARLOW GAS COMPANY. Anderson, Westminster.

General Stores, Dip Pipes, Valves, &c.
WARRINGTON GAS DEPARTMENT. Tenders by May 22

Lime.
BURTON-ON-TRENT GAS DEPARTMENT. Tenders by May 20.
LEEDS GAS DEPARTMENT. Tenders by May 25.
WALSALL GAS DEPARTMENT. Tenders by May 30.

Pipes and Fittings, &c.
LEEDS GAS DEPARTMENT. Tenders by May 25.
WARRINGTON GAS DEPARTMENT. Tenders by May 22.

Retorts.
WARRINGTON GAS DEPARTMENT. Tenders by May 22.

Steel Joists and Rails.
WARRINGTON GAS DEPARTMENT. Tenders by May 22.

Tar.
ARBROATH GAS DEPARTMENT.
BURTON-ON-TRENT GAS DEPARTMENT. Tenders by May 20.
LONDON COUNTY ASYLUM, BANSTEAD. Tenders by May 14.
LONGTON GAS DEPARTMENT. Tenders by May 26.
MANSFIELD GAS DEPARTMENT. Tenders by May 26.
ROTHERHAM GAS DEPARTMENT. Tenders by May 19.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.,

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

IT is worth your while to buy direct. THE RELIANCE LUBRICATING OIL COMPANY 19 and 20, Water Lane, Great Tower Street, London, E.C., handle all kinds of Lubricating Oils, for Engines, Cylinders, Dynamos, Spindles, &c., Burning Oils, Solar Distillates, Carburetting Oils, and Spirits for Gas Making; Motor Oils, Fuel Oils, Animal, Fish, and Vegetable Oils, &c., for all purposes. Write for our "Trade Mark" Inkstand, sent free to customers. Non-customers, 2s. 6d. each. RELIANCE LUBRICATING OIL COMPANY, London, Glasgow, Newcastle-on-Tyne, &c. Established 1858. Telegraphic Address: "Subastral," London; A.B.C. Code used. Telephone No.: Avenue 5891.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

NOW Ready. Price 6d.—"Analyses of BRITISH COALS AND COKE COLLECTED AND COMPARED." Part I.—Northumberland, Durham, and Yorkshire. (Reprinted from the Colliery Guardian.)
THE COLLIERY GUARDIAN CO., LTD., 49, Essex Street, Strand, LONDON, W.C.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

EERSTE Hollandsche Yzererts Maaty (First Dutch Bog Ore Company, Ltd.), ROTTERDAM.
General Manager for England and Wales—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.
VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

COURT ROYAL CYCLES are largely supplied to Public Officials. Specially REDUCED PRICES to GAS MANAGERS and ASSISTANTS where unrepresented. See and test one of these sterling high-grade Manufactures before deciding upon any new purchase. Large Catalogue, Books of Testimonials, and Special Prices sent, on application, from the Makers
LLOYD COURTS AND CO., COVENTRY.

BY the adoption of Cripps's Bye-Pass VALVES inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.
Sole Makers: C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SHROPSHIRE.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

COAL GAS TAR wanted.
Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers Sharpness Docks, GLOS.

OXIDE OF IRON.

FIRE CEMENT, PAINT, GAS COAL.

BALE & CHURCH, 5, CROOKED LANE, LONDON, E.C.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 343 Holborn.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

THE Position of Assistant Gas-Works MANAGER in the North of England has been FILLED UP.

THE EVESON COAL AND COKE COMPANY LIMITED, BIRMINGHAM,

ASK for Prices of Gas Coke in any quantities, delivered into waggons at Sellers' Station.

GAS-METERS wanted, old disused Wet.
Copper Lamp Frames, Brass, Pewter, Tin, Zinc, Lead Ashes, Old Copper Electric Cable, &c., for Cash.
J. SMITH, Canal Road, BRADFORD.

WANTED, Situation as Works' Clerk.
Three Years' at Local Gas-Works. Shorthand and Book-keeping. Good References.
Address C. B., 170, High Street, Watford, HE

WANTED, Situation as Works' Clerk. Three Years at Local Gas-Works. Shorthand and Book-keeping. Good References.
Address C. B., 170, High Street, Watford, HERTS.

TRAVELLER, with good connection in South-Eastern Counties, lately representing good Firm, desires re-engagement. Excellent References. Age 27.
Address W. W., 83, Preston Street, FAVERSHAM.

MANAGER or Distribution Superintendent is OPEN TO ENGAGEMENT. Fully qualified. Large experience in modern Works. Excellent References.
Address No. 4025, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION Wanted as Outside Superintendent, Public Lighting and Meter Inspector and Collector. Abstainer. Age 37. First-Class Testimonials.
Address, CHARLES SILMS, 35, Nelgarde Road, CATFORD, S.E.

TRAVELLER is shortly Open to an ENGAGEMENT with a firm of Gas Engineers and Contractors. Extensive connection and can introduce good business.
Address No. 4032, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

YOUNG Man, Diploma Central Technical College, London, in Chemistry, also training in Physics and Engineering, good knowledge of Gas Chemistry, five years Analyst on large Manufacturing Works, desires appointment on Gas-Works as CHEMIST, with opportunity of obtaining knowledge of Works Engineering (Home or Foreign). Age 27.
Address, CHEMIST, 14, King Street, IPSWICH.

WANTED, at once, a capable man to lay Yard Connections.
Only experienced and steady men need apply to the MANAGER, Gas-Works, Brentwood, ESSEX.

WANTED, a Carbonizing Foreman Must understand Regenerative Firing, and be capable of controlling Men. Eight-hour Shifts. Wages 45s. per week.
Apply, by letter, to the MANAGER, Gas-Works, COVENTRY.

GOOD Working Manager wanted. State Wages required, Age, and Family. Cottage, Fire, and Light provided on Works.
Apply, by letter, to No. 4027, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a reliable and steady Man, thoroughly experienced in all branches of In and Out Door Gas Lighting, capable of taking ENTIRE CHARGE of the Business of an Old-Established House in London. Only First-class men need apply.
Apply, by letter, stating Salary required, Age, and Experience, to No. 4030, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING Foreman wanted for the Broughty Ferry Gas Department. Must know the working of Regenerator Settings and the usual routine, and be able to handle a few men well, and look to Conveying Plant and West's Manual Stokers.
Particulars as to duties and wages may be had from
FORBES WADDELL,
Manager.

WANTED, for Cape Town and district, a METER REPAIRER, used to Automatic and Ordinary (both Wet and Dry) Meters. Salary £3 per week to commence. Applicants must apply, on foolscap paper (one side only), and state Age and Qualification. Single men only considered.
Apply to the SECRETARY, Cape Town Gas Company, 35, New Broad Street, LONDON, E.C.

MANAGER Wanted for Compressed Gas-Works in Glasgow, making Oxygen, Carbonic Acid, Nitrous Oxide, Glauber's Salt, and Valves for Gas Bottles. Must be a thoroughly Trained Chemist, preferably with a science degree, and be accustomed to the management of men and the erection of machinery and plant.
State Age, Experience, and Salary expected, and send References and *copies* of Testimonials. All communications will be treated in strict confidence.
Address No. 4031, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

HALIFAX CORPORATION TAR-WORKS.

WANTED, immediately, an experienced FOREMAN for the above Works, with knowledge of the "Lennards" continuous still preferred.
Applications, stating Age, Salary, and Experience, accompanied with *copies* of three testimonials, must be sent to Mr. Councillor Wadsworth, Chairman of the Gas Committee, Town Hall, not later than Nine a.m., the 18th inst.
REG. T. STODDARD,
Manager.

HALIFAX CORPORATION TAR-WORKS.

STILLMEN.

WANTED, Two experienced Stillmen for the above Works. Must be steady and reliable men. Wages 6s. per day.
Applications, stating Age and where previously employed, accompanied with References, must be sent to Mr. Councillor Wadsworth, Chairman of the Gas Committee, Town Hall, not later than Nine a.m. the 18th of May, 1903.
REG. T. STODDARD,
Manager.

WANTED, for the Dorking Gas Company, a thoroughly Competent FITTER to Fit up Houses for Gas and Lay Mains and Services. Wages 33s. per week and Commission for new consumers Smart, energetic candidates may apply, by letter, to the Manager, stating Age, and enclosing Testimonials or References.

CLEETHORPES GAS COMPANY.

WANTED, an energetic and experienced Man to TAKE CHARGE of the Distributing Department. He must be a good Timekeeper, competent to control Workmen, and understand the proper keeping of the Stores belonging to this Department.
Apply, by letter, stating Age, Experience, and enclosing *copies* only of Testimonials.
E. J. BROCKWAY,
Engineer and Secretary.

TO BE SOLD—Purifiers, Two or Four, 10 feet square by 4 ft. 6 in. deep, planed Joints, Connections, and Overhead Girders.
Write J. WRIGHT, 181, QUEEN VICTORIA STREET, E.C.

FOR SALE—Four 9 feet square Purifiers, complete with 8-inch Centre-Valve, Connections, and Lifting Apparatus. In very good condition. Can work three or four Purifiers as desired. Can be seen at work.
For further Particulars, apply to J. DAVIES, Gas-Works, NANTWICH.

GAS-WORKS for Sale, in thriving condition, and paying good interest.
Apply, by letter, to No. 4026, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—Very good Gas Plant as under:—
PURIFIERS—Four 12 feet square, with 8-inch Centre-Valve and Connections. Planed Joints.
Kirkham WASHER-SCRUBBER, 300,000 cubic feet per diem, with Engine and 8-inch Valves and Connections.
Livesey WASHER, 250,000 cubic feet per diem, with 8-inch Valves and Connections.
Photos. sent on application to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

COUNTY BOROUGH OF BLACKBURN.
(GAS DEPARTMENT.)

THE Gas Committee are open to receive OFFERS for a quantity of Second-Hand Two and Three Light WET METERS, and are prepared, if required, to put all, or part, into proper working order, and have same officially tested and stamped.
All offers to be addressed to
S. R. OGDEN,
Engineer and Manager,
Municipal Offices: Blackburn,
May 8, 1903.

GAS PLANT FOR SALE.

OWING to the acquirement of the Works of the Colne Vale Gas Company, and the closing down of these Works, the Longwood Gas Company have FOR SALE the following PLANT in good condition:—
One HOLMES' TOWER SCRUBBER, 5 ft. by 12 ft., mounted on Thurston's Square Tar-Extractor, 5 ft. 6 in. by 5 ft.
One HOLMES' WASHER, cylindrical, 16 ft. by 4 ft. 6 in., with Rope Driving Gear and Shaft.
One COWAN CYLINDRICAL STATION METER, measuring 6 ft. 6 in. by 6 ft., with 12-inch Connections; capacity 10,000 feet per hour.
One 5000 cubic feet per hour EXHAUSTER, with Accessories and Engine in duplicate.
One 500-light STATION METER.
One Wrought-Iron Cylindrical STORAGE TANK, 26 ft. by 7 ft.
One Cast-Iron STORAGE TANK, 6 ft. 6 in. by 5 ft. by 5 ft., with Cast-Iron Draw-Off Cock.
Six Cast-Iron CONDENSERS, each 9 ft. 6 in. high, and 2 ft. diameter, with square base, 17 ft. by 3 ft by 1 ft. 3 in., fitted with Cleaning-Out Lids for each Pipe.
The following MOUTH-PIECES, with Ascension and Dip Pipes to suit:—
28 OVALS, 18 in. by 14 in.
Seven OVALS, 18 in. by 15 in.
27 ○ 21 in. by 15 in.
Two Cast-Iron SLAKING TROUGHS, 4 ft. by 2 ft. 6 in. by 2 ft.
Also 100 Second-hand STREET LANTERNS.
Inspection invited.
Further Particulars on application to
J. H. BREARLEY,
Gas Engineer.
Longwood.

TENDERS wanted for Gas Coal Tar by the Arbroath Gas Corporation.
Schedule of quantity, &c., from the GAS ENGINEER, Mr. Alex. C. Young, ARBROATH.

CARLOW GAS COMPANY (IRELAND).

TENDERS are invited for the construction of a 66 feet diameter GASHOLDER TANK.
Plan and Specification obtainable from the undersigned on payment of one guinea.
R. BRUCE ANDERSON, Assoc. M.Inst.C.E.,
35A, Great George Street,
Westminster, S.W.

BOROUGH OF TIVERTON.

TENDERS FOR COAL.

THE Lighting Committee are prepared to receive TENDERS for GAS COAL for their Gas-Works at Tiverton for one year.
Further Particulars and Form of Tender may be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tender for Gas Coal," and addressed to Mr. C. M. Hole, Town Clerk, Tiverton, must be received before Eleven o'clock on Monday, the 1st day of June next.
By order,
WM. LITTLEWOOD,
Manager.
Tiverton, May 7, 1903.

DOWNHAM MARKET GAS AND COKE COMPANY.

THE Directors of the above Company invite TENDERS for the supply of about 700 Tons of screened GAS COAL or NUTS, to be delivered at the Gas-Works Siding, Downham Market, by the end of June, 1904, in such quantities as may from time to time be determined by the Company's Engineer.
Tenders, endorsed "Coal," to be sent to the undersigned not later than the 23rd of May, 1903
The Directors do not bind themselves to accept the lowest or any Tender.
(Signed) JOHN S. PARROTT,
Secretary.
Downham Market,
May 8, 1903.

TIPTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply and delivery of 10,000 Tons of good screened GAS COAL, NUTS, &c.
Forms of Tender may be had on application to the undersigned; and only offers on our own Form will be considered.
Tenders, endorsed "Gas Coal," addressed to J. W. Waring, Esq., Clerk to the Council, Public Offices, Owen Street, Tipton, on or before May 16, 1903.
The lowest or any Tender not necessarily accepted.
By order,
SIDNEY O. STEPHENSON,
Engineer and Manager.
Tipton Gas-Works, May 5, 1903.

TENDERS FOR COAL.

THE Urban District Council of Ballymena, Gas Department, invite TENDERS for the supply of 1500 Tons of best Double Screened GAS COALS, to be delivered into Railway waggons at Larne Harbour. A large proportion of the Coal can be taken before the 1st of November, 1903.
Each cargo to be accompanied by a certificate as to place of origin.
Sealed Tenders, endorsed "Tenders for Coal," to be sent to Mr. H. O'Hara, Clerk of Council, Town Hall, not later than the 29th of May, 1903.
The Council do not bind themselves to accept the lowest or any Tender.
By order,
WM. NISBET,
Manager.
Gas-Works, Ballymena.

RICKMANSWORTH GAS COMPANY.

TENDERS FOR COALS.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 2000 Tons, or thereabouts, of screened GAS COAL or NUTS, to be delivered free at Rickmansworth (Metropolitan) Station as required between the 1st of July, 1903, and the 30th of June, 1904.
Tenders, sealed and endorsed "Tender for Coals," to be delivered at the Works not later than Thursday, May 28, 1903.
The Directors do not bind themselves to accept the lowest or any Tender.
HENRY HILL,
Engineer and Manager.
Gas-Works, Rickmansworth,
May 7, 1903.

BOROUGH OF BURTON-UPON-TRENT.

THE Gas Committee invite Tenders for:—

GAS COAL.

The supply of 32,000 Tons of best screened GAS COAL and 5000 Tons of CANNEL, to be delivered in Sender's or Railway Company's Trucks at the Gas-Works during the Twelve Months ending June 30, 1904, in accordance with the Form of Tender and Conditions which may be obtained from the undersigned.

LIME.

The supply of about 300 Tons of best Hand-Picked LIME for Purifying, to be delivered in Sender's or Railway Company's Trucks at the Gas-Works in such quantities and at such times as may be required during the Twelve Months ending June 30, 1904.

TAR.

The purchase of the surplus TAR, which will be produced and delivered into the Purchaser's Tank-Trucks at the Gas-Works during the Twelve Months ending June 30, 1904.
Terms of Payment, Net Cash Monthly.
Tenders, endorsed Coal, Lime, and Tar respectively, are to be delivered to the undersigned on or before Wednesday, the 20th day of May, 1903.
The Committee do not bind themselves to accept any Tender.
F. L. RAMSDEN,
Manager and Engineer.
The Gas-Works,
Burton-upon-Trent, May 4, 1903.

THE Ware Gas Company, Limited, invite TENDERS for the supply of from 1800 to 2000 Tons of East Pontop, Barrow, Norfolk, or Strafford Silkstone, or Aldwarke Main GAS COAL for the year ending the 24th day of June, 1904.

Particulars may be obtained of the undersigned.

Sealed Tenders to be delivered to me on or before the 1st day of June prox.

The lowest Tender will not necessarily be accepted.

Dated this 9th day of May, 1903,

GEO. H. GISBY,
Secretary.

Ware, Herts.

TENDERS FOR GAS COAL.

THE Directors of the Westerham Gas and Coke Company, Limited, invite TENDERS for the supply of about 500 to 600 Tons of Best Screened GAS COAL, to be delivered to Westerham Station in quantities of 50 Tons at the time, to suit the convenience of the Directors during the ensuing Year.

Tenders, endorsed "Tender for Coal," to be sent in by May 27, 1903.

The Directors do not bind themselves to accept the lowest or any Tender.

By order of the Directors,

C. W. HOOKER,
Secretary.

Westerham.

MORLEY CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the above Cor poration are prepared to receive TENDERS for the supply of 12,000 Tons of BEST GAS COAL during the year ending June 30, 1904.

Forms of Tender may be obtained on application to Mr. H. J. Hemingway, Town Hall, Morley.

Endorsed Tenders to be sent to the undersigned not later than Saturday, the 16th of May.

FRED. THACKRAY,
Town Clerk.

Town Hall, Morley,
May 8, 1903.

THE Directors of the Sutton, South- coates, and Drypool Gas Company, Hull, invite TENDERS for the supply of 18,000 Tons of BEST SILKSTONE GAS COAL, stating price per ton for each of the following descriptions: Screened, Unscreened, and Cobbles, for delivery during the year ending the 31st of May, 1904, in North Eastern Railway Company's waggons into this Company's Siding, Dansom Lane, Hull

The lowest or any Tender will not necessarily be accepted.

Sealed Tenders to be sent addressed to the undersigned before Twelve o'clock noon on Tuesday, the 26th of May, 1903, marked "Tender for Coal,"

By order,

DAVID WOOD,
Secretary.

Offices: St. Mark's Street,
Hull, May 8, 1903.

CORPORATION OF LEICESTER.

GAS COAL.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply of COAL, COBBLES, or NUTS (about 160,000 Tons), for the Twelve Months ending May 31, 1904.

Particulars and Form of Tender can be obtained upon Application to the Engineer.

Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Gas Coal," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, May 23, 1903.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M. Inst. C.E., M. Inst. E.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, May 8, 1903.

ULVERSTON URBAN DISTRICT COUNCIL.

TENDER FOR COAL AND CANNEL.

THE Gas and Water Committee are prepared to receive TENDERS for the supply of best Screened GAS COAL and CANNEL during the ensuing Year, commencing the 1st of July next.

Parties tendering must give particulars of the Coal they propose to supply, and name the pit from which the same will be raised.

Further Information and Forms of Tender may be obtained on application to the undersigned.

Sealed Tenders, endorsed "Tender for Coal" or "Cannel," addressed to the Chairman of the Gas and Water Committee, to be sent in not later than the 28th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

JNO. SWAN,
Engineer and Manager.

COUNTY BOROUGH OF WARRINGTON.
(GAS DEPARTMENT.)

THE Gas Committee of the above Borough invite TENDERS for the following Goods, viz.:—

1—FIRE-CLAY BRICKS AND RETORTS.
2—RETORT SELF-SEALING MOUTHPIECES.
3—CLINKERING DOORS.
4—ASCENSION AND DIP PIPES.
5—HYDRAULIC MAIN.
6—SEAL VALVES.
7—STEEL JOISTS AND RAILS.
8—MAINS AND SPECIALS.

Apply for Particulars, before the 22nd inst., to Mr. W. S. Haddock, Gas Engineer.

FREDK. TAYLOR,
Secretary.

Gas Offices, Warrington,
May 7, 1903.

BOROUGH OF LONGTON.
(GAS AND ELECTRICITY DEPARTMENT.)

TENDERS FOR TAR.

THE Gas and Electricity Committee in- vite TENDERS for the purchase of their surplus TAR during Twelve Months ending June 30, 1904.

Sealed Tenders, endorsed "Tender for Tar," to be sent in addressed to the Chairman of the above Committee not later than Tuesday, May 26.

The Committee do not bind themselves to accept the lowest or any Tender.

W. LANGFORD,
Engineer and Manager.

May 1, 1903.

LEEDS CORPORATION.
(GAS DEPARTMENT.)

TENDERS required as below:—

For WROUGHT-IRON TUBES.
For Pressed and Common RED BRICKS.
For 2½-inch, 3-inch, and 4-inch Self-faced Bradford or Halifax FLAGS.

Forms of Tender may be had on application to the undersigned.

Endorsed Tenders, addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, must be delivered not later than Monday, the 25th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Gas Offices, Leeds,
May 8, 1903.

LEEDS CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of about 11,000 Tons of Craven or Derbyshire LIME required for the Purification of Gas at the several Gas-Works, during the Twelve Months commencing on the 19th of July, 1903.

Forms of Tender may be obtained on application to the undersigned.

Endorsed Tenders, addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, must be delivered not later than Monday, the 25th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Gas Offices, Leeds,
May 8, 1903.

STOCKTON-ON-TEES CORPORATION.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Cor poration invite TENDERS for the supply, in whole or part, of from 30,000 to 35,000 Tons of GAS COAL for the year ending March 31, 1904.

Tenders, sealed and endorsed "Tenders for Gas Coal," to be sent in not later than noon of the 21st day of May, 1903, addressed to the undersigned at the Gas-Works, Thompson Street, from whom Forms of Tender, &c., can be had.

The Gas Committee do not bind themselves to accept the lowest or any Tender.

By order,

WILLIAM FORD,
Manager.

Corporation Gas-Works,
Thompson Street, Stockton-on Tees,
May 7, 1903.

CONTRACT FOR GAS COALS.

THE Milton-next-Sittingbourne Urban District Council invite TENDERS for the supply and delivery during the Year ending the 19th of May, 1904, of about 1400 Tons of GAS COALS, to be supplied at such times, and in such quantities, as the Manager of the Gas-Works shall direct.

Full Information, with Forms of Tender, can be obtained on application to the Manager, Mr. J. Watson, Gas-Works, Milton-next-Sittingbourne.

Sealed Tenders, which must be on the form supplied, should be addressed to the undersigned, and endorsed "Tender for Gas Coals."

The Tenders must be sent or delivered to me on or before Saturday, the 23rd of May, 1903.

The Council do not bind themselves to accept the lowest or any Tender.

By order,

JNO. DIXON JUNR.,
Clerk to the Council.

Milton-next-Sittingbourne, Kent,
May 6, 1903,

SOWERBY BRIDGE URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR CANNEL AND COAL.

THE Gas Committee invite Tenders for the supply and delivery of 1400 Tons of CANNEL and 14,600 Tons BEST SCREENED GAS COALS, or such quantity as may be required for the Gas-Works at Sowerby Bridge and Luddenden Foot during the period of Twelve Months from the 1st of June, 1903, to the 31st of May, 1904.

Tenders will be received for the whole or any portion of the above quantity.

Specifications, Form of Tender, and all Information can be obtained on application to the Engineer, Mr. A. W. Bissell, Gas-Works, Sowerby Bridge.

The Gas Committee reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, to be delivered not later than Twelve o'clock noon on Monday, May 25, 1903 (endorsed "Tender for Coal" or "Cannel"), to

R. W. EVANS,
Solicitor and Clerk to the Council.

Commercial Bank Chambers, Halifax,
May 8, 1903.

NEWPORT (MON.) GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for the supply of about 30,000 Tons of best GAS COALS for the period of One Year from the 1st of July next, to be delivered on the Company's Sidings at their Works at Mill Street or Crindau, in such quantities and at such times as may be directed by the Company's Engineer, from whom further Information may be obtained.

Tenders will be received for the whole or part of the above quantity.

Tenders, endorsed "Coals," to be delivered at the Offices of the Company not later than Monday, the 25th of May, 1903

The Directors do not bind themselves to accept the lowest or any Tender.

By order of the Board of Directors,

T. H. HAZELL,
Secretary.

Newport, Mon.,
May 8, 1903.

LURGAN GASLIGHT AND CHEMICAL COMPANY, LIMITED.

THE Directors invite Tenders for the supply of 3500 Tons of best quality Screened GAS COAL, delivered into the Works at Lurgan, or placed on Lighters or on Rail at Belfast.

The Coal must be delivered in such quantities and at such times as the Directors may fix; but a large proportion can be taken before the 1st of November. Each cargo to be accompanied by a Certificate as to place of origin.

Tenders (in sealed envelope), accompanied by reference to Gas-Works using the Coal offered, should reach me not later than 10 a.m., on Monday, the 1st of June, 1903.

The Directors do not bind themselves to accept the lowest or any Tender.

FRED. W. MAGAHAN,
Secretary.

Gas-Works, Lurgan,
May 4, 1903.

LONDON COUNTY ASYLUM, BANSTEAD, SUTTON, SURREY.

THE Sub-Committee for the Control and Management of the above-named Asylum are prepared to receive OFFERS for the purchase of TAR and AMMONIACAL LIQUOR (5° Twaddel, 10 oz.) for the Twelve Months ending the 31st of March, 1904.

Terms, cash on removal.

Forms of Tender, with estimated quantities for sale, may be obtained on application to the Storekeeper at the Asylum.

Tenders must be sent in sealed covers, endorsed "Tender for Tar and Liquor, Banstead Asylum," to the undersigned, by or before Ten o'clock a.m. on Thursday, May 14, 1903.

The Sub-Committee do not bind themselves to accept the highest or any Tender.

R. W. PARTRIDGE,
Clerk of the Asylums Committee,

London Asylums Committee Office,
6, Waterloo Place, S.W.
May 5, 1903.

COUNTY BOROUGH OF ROTHERHAM.
(GAS DEPARTMENT.)

SURPLUS TAR CONTRACT.
AMMONIACAL LIQUOR CONTRACT.

THE Gas Committee are prepared to re- ceive TENDERS for the purchase of the Surplus TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the Twelve months ending the 30th of September, 1904.

The estimated quantity of Tar is about 900 Tons.

The estimated quantity of Liquor is about 2800 Tons.

The Works are about 550 yards from the Rotherham Midland Station, 440 yards from the Great Central Station, and 350 yards from the Canal Wharf.

Further Information and Forms of Tender may be obtained upon Application to the Secretary, Mr. Thomas Bellamy, at the Gas-Works.

No Tender will be considered if not made on the proper Form.

Sealed Tenders to be sent in to me not later than Tuesday, the 19th inst., endorsed "Tender for Tar or Ammoniacal Liquor."

By order,

H HAMPTON COPNALL,
Town Clerk.

Town Hall, Rotherham,
May 8, 1903.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 33,000 Tons of GAS COAL for One Year from the 1st day of July next, in such monthly quantities as may be required by the Company.

Tenders to state the price delivered at the Midland Railway Sidings, Hempsted, near Gloucester, or the Great Western Railway Wharf, Llanthony, Gloucester; or if sent (as preferred) by Water, the price f.o.b., and also the price delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.

Further Particulars and Forms of Tender may be obtained of the undersigned.

Sealed Tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than Monday, the 1st day of June next.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,

WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
May 8, 1903.

DENBIGH GAS AND COKE COMPANY, LIMITED.

TENDERS are invited for the supply of 1200 Tons of MAIN GAS COAL, to be delivered to Denbigh Station.

Tenders are to be sent in on or before Monday, the 25th of May, 1903.

The lowest or any Tender not necessarily accepted.

W. EWART BROCK,
Manager and Secretary.

Gas-Works, Denbigh, N. Wales.

DRONFIELD GAS LIGHT AND COKE COMPANY.

THE Directors of the above Company invite TENDERS for the supply of 1000 Tons of best GAS COAL.

The coal is to spread over the Twelve Months ending June 30, 1904, and is to be delivered in such quantities, and at such times, as the Secretary or Manager may from time to time direct.

The Tenders are to be sent in not later than Friday, the 29th inst., and to be endorsed "Tender for Gas Coal."

HAROLD WHITE,
Secretary.

May 7, 1903.

BOROUGH OF WALSALL.

TENDERS FOR GAS COAL.

THE Corporation of Walsall invite TENDERS for the supply of 30,000 Tons of good screened GAS COAL, and 18,000 Tons of screened GAS NUTS, to be delivered during One Year from the 1st of July next, at the Corporation Siding, at the Pleck Gas-Works, Walsall, as may be required.

Forms of Tender and Specification may be obtained on application to the undersigned.

The Corporation do not bind themselves to accept any Tender, and they reserve the right to divide the Contract between several firms.

Tenders, sealed and marked outside "Tender for Gas Coal," and stating the price for large Coal, and also for Nuts, are to be sent to the undersigned on or before Saturday, the 30th of May, inst.

JOHN R. COOPER,
Town Clerk.

Borough Offices, Walsall,
May 7, 1903.

BOROUGH OF WALSALL.

TENDERS FOR BENZOL AND FOR BENZOLIZED CREOSOTE.

THE Corporation of Walsall invite TENDERS for about 6000 gallons of 90 per cent. BENZOL for enriching purposes, and also TENDERS for 4000 gallons of BENZOLIZED CREOSOTE, free from Naphthalene, to be delivered during One Year, from the 1st of July next, in drums or in casks, to the Corporation Sidings at the Pleck Gas-Works, Walsall.

Further Particulars may be obtained from the Engineer at the Pleck Gas-Works, Walsall.

The Corporation do not bind themselves to accept any Tender, and they reserve the right to divide the contract between several firms.

Tenders, sealed and marked outside "Tender for Benzol," or "Tender for Benzolized Creosote," are to be sent to the undersigned not later than Saturday, the 30th of May, inst.

When tendering for the Benzol, the amount of purity should be stated.

JOHN R. COOPER,
Town Clerk.

Borough Offices, Walsall,
May 7, 1903.

TO LIME MASTERS.

THE Corporation of Walsall invite TENDERS for the Supply of about 1000 Tons of LIME, which will be required at their Gas-Works during One Year from the 1st of July next; the deliveries to be in such monthly quantities as the Manager of the Gas-Works may from time to time direct.

The Lime is to be hand-picked, and clear from refuse and ashes, and to be delivered at the Corporation siding at the Pleck Gas-Works as required.

Payments monthly.

Tenders, sealed and marked outside "Tender for Lime," are to be sent to the undersigned on or before Saturday, the 30th of May, inst.

JOHN R. COOPER,
Town Clerk.

Borough Offices, Walsall.
May 7, 1903.

MANSFIELD CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL AND CANNEL.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

COAL.

THE Gas Committee are prepared to receive TENDERS for 2000 Tons of CANNEL and 9000 Tons of best screened GAS COAL, delivered at Mansfield Station, for One Year from the 1st of June, 1903, to the 31st of May, 1904.

TAR AND LIQUOR.

Tenders for surplus TAR and LIQUOR made during the Year, from the 1st of July, 1903, to the 30th of June, 1904. Tenders for Liquor to be made either at a fixed price per Ton or on the Sliding-Scale regulated by the price of Sulphate.

Tenders, endorsed "Coals," or "Tar and Liquor," as the case may be, to be sent to J. Harrop White, Esq., Town Clerk, Mansfield, on or before the 26th of May, 1903.

Particulars and all other Information from the undersigned.

No Special Form of Tender provided.

The Committee do not bind themselves to accept the lowest or any Tender.

ARTHUR GRAHAM,
Engineer and Manager.

Gas-Works, Mansfield,
May 6, 1903.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

TENDERS FOR ENGINE SLACK.

THE Company are Prepared to receive TENDERS for the supply of ENGINE SLACK, at their various Pumping-Stations, for Twelve Months from the 1st of July, 1903.

Forms of Tender, giving Particulars as to the Quantity of Coal to be delivered at the various Stations, can be obtained on application to me.

Tenders made out on the Forms provided, and endorsed "Tenders for Slack," must reach me at latest by Twelve noon on Monday, the 18th of May, 1903.

H. ASHTON HILL, M.Inst. C.E.,
Engineer.

Paradise Street, Birmingham.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the Half-Yearly Ordinary General Meeting of the Proprietors of this Association was held, at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 5th inst.—

JOHN HORSLEY PALMER, Esq., Deputy-Chairman, in the Chair,

when the following RESOLUTIONS were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes."

"That a Dividend of 5 per cent. for the Half Year ended Dec. 31 last be declared upon the £3,800,000 Capital Stock of the Association, and that the same be payable, free of Income-Tax, on and after the 12th inst."

"That Robert Tindall, Esq., be re-elected a Director of the Association."

"That Sir Charles James Jessel, Bart., be re-elected a Director of the Association."

"That John Henry Birchenough, Esq., be re-elected a Director of the Association."

"That Joseph Gurney Fox, Esq., be elected an Auditor of the Association."

Votes of Thanks were passed to the Directors for their able management of the affairs of the Association, to the Chairman for his conduct in the Chair, and to the Staff in London and on the Continent.

By order of the Board,
ROBERT W. WILSON,
Secretary.

21, Austin Friars, London, E.C.,
May 6, 1903.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF £200,000 THREE PER CENT. DEBENTURE STOCK.

Created under the East London Water-Works Act, 1900.

NOTICE is Hereby Given, that it is the intention of the Directors to offer for public TENDER the sum of £200,000 THREE PER CENT. DEBENTURE STOCK (less Income-Tax) under the East London Water-Works Act, 1900, redeemable at par after the expiration of 25 years from the date of issue, subject to Six Months' Notice being given by the Company.

This Stock is a legal investment for trustees, and ranks with the other Debenture Stock of the Company for payment of interest, and has priority over the Ordinary Stock (amounting to £1,720,560).

Tenders to be delivered at the Company's Offices, 15a, St. Helen's Place, E.C., not later than One o'clock p.m. on Tuesday, the 26th of May, 1903.

The purchase money to be paid to the Company's Bankers on or before the 4th of June, 1903, but the allottees will have the option of paying half the amount of the purchase money on that date, and half on Thursday, the 16th of July, 1903.

Seven Months' Interest will be payable on the 1st of January, 1904, in respect to the sums paid on the 4th of June, 1903, and Six Months in respect to the sums paid on the 16th of July, 1903.

Full Particulars and Conditions may be obtained at the Offices, or will be forwarded on application.

By order,
I. A. CROOKENDEN,
Secretary.

15a, St. Helen's Place, E.C.,
April 24, 1903.

GORING AND STREATLEY DISTRICT GAS AND WATER COMPANY, LIMITED.

SALE BY TENDER OF

600 5 PER CENT. PREFERENCE SHARES OF £5 EACH.
200 7 " " ORDINARY " " £5 "

In the

WATER UNDERTAKING.

THE Directors Hereby Give Notice, that they will be prepared to receive sealed TENDERS, not later than Ten o'clock, a.m., on Monday, May 18, 1903, for this additional Capital.

Minimum Price for Preference Shares £5 each.
" " " Ordinary " £5 10s. each.

Being a portion of the additional Capital Authorized by Parliament in 1902 for extensions to existing Works and Mains. Out of the profits of the undertaking dividends at the rate of 5 per cent. were paid on the whole share Capital for the years 1901 and 1902.

Particulars and Conditions of Sale, with printed Form of Tender, may be had on application at the Offices of the Company, 20, Bucklersbury, London, E.C.; at the Works, Goring-on-Thames, Oxon; of Messrs. Scadding and Bodkin (the Company's Solicitors), 23, Gordon Street, Gordon Square, London, W.C.; and at the Metropolitan Bank of England and Wales, 60, Gracechurch Street, London, E.C., and at their Reading, Pangbourne, and Goring branches.

By order,
J. HUNT,
Secretary.

May 11, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

NEW ISSUE OF £3000 CONSOLIDATED ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND GAS COMPANY.

NEW ISSUE OF £5464 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, May 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

LOWESTOFT WATER AND GAS COMPANY.

SALE BY AUCTION OF 400 ADDITIONAL ORDINARY £10 SHARES.

Ranking for 7 per cent., the Dividend on similar Shares in the Company having been 5½ per cent. for several years past; also

£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, May 26, at Two o'clock, in Lots, by order of the Directors.

The Company, incorporated in 1853, supplies Water and Gas in Lowestoft and the surrounding district. The Water-Rental in 1891 was £7146; in 1902, it exceeded £14,000; and the Gas Consumption has advanced from 43 million cubic feet in 1891 to upwards of 73 millions in 1902. New Works to keep pace with the increasing demand for Water and Gas are necessary; and it is for these Works that the new Capital is being raised.

Particulars of Sale, and Form of Instructions for the Auctioneer or Secretary to purchase for Investors unable to attend the Auction, obtainable post free of the SECRETARY of the Company, 137, London Road, Lowestoft, and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

WAKEFIELD GASLIGHT COMPANY.

MINIMUM PRICE £110 PER CENT.

SALE BY TENDER OF £20,000 FOUR-AND-A-HALF PER CENT. PREFERENCE STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £20,000 of the above PREFERENCE STOCK, to be paid up in full on or before the 1st of July next, such Stock being a portion of Additional Capital authorized to be raised by Resolution passed at an Extraordinary General Meeting of the Shareholders held on the 5th day of May, 1903, pursuant to Section 11 of the Wakefield Gas Act, 1877.

Dividends at the rate of £11 10s. per centum per annum have been paid on the Original Shares for the last Fourteen years.

Particulars and Conditions of Sale and Form of Tender may be obtained on application at this Office; and sealed Tenders must be sent in not later than Monday, the 8th day of June, 1903.

By order of the Board,
W. H. PARKER.

Gas Office, Warrengate,
Wakefield, May 5, 1903.

Now Ready, Price 10s. 6d., Green Cloth, Gilt Lettered.

VOL. LXXXI.

OF THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, &c.

Containing the Thirteen Numbers issued during the Three Months, January to March last, together with the Thirteen Plates referring to the New Granton Works of the Edinburgh and Leith Gas Commissioners, and many Photographic Illustrations.

GREEN CLOTH CASES for Binding the Quarterly Volumes of the "JOURNAL," Gilt Lettered, may be had price 2s.

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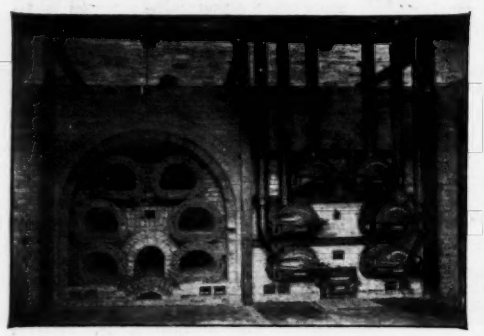

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GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
Also Removal of last Traces of
SULPHURETTED HYDROGEN
in catch position.
Full Particulars on application to the Patentees
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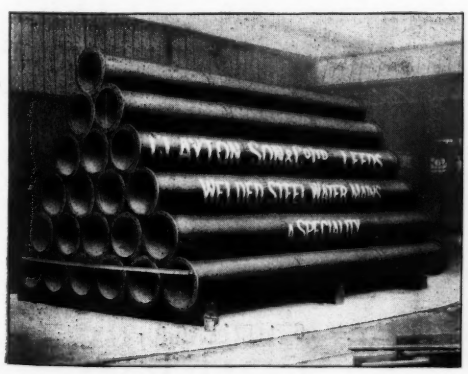

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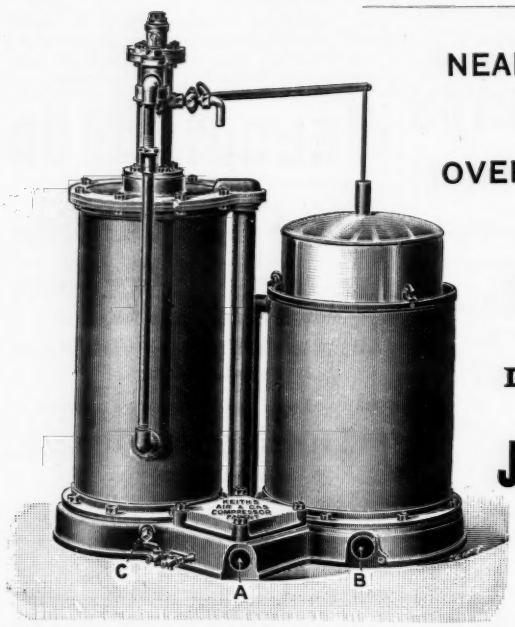

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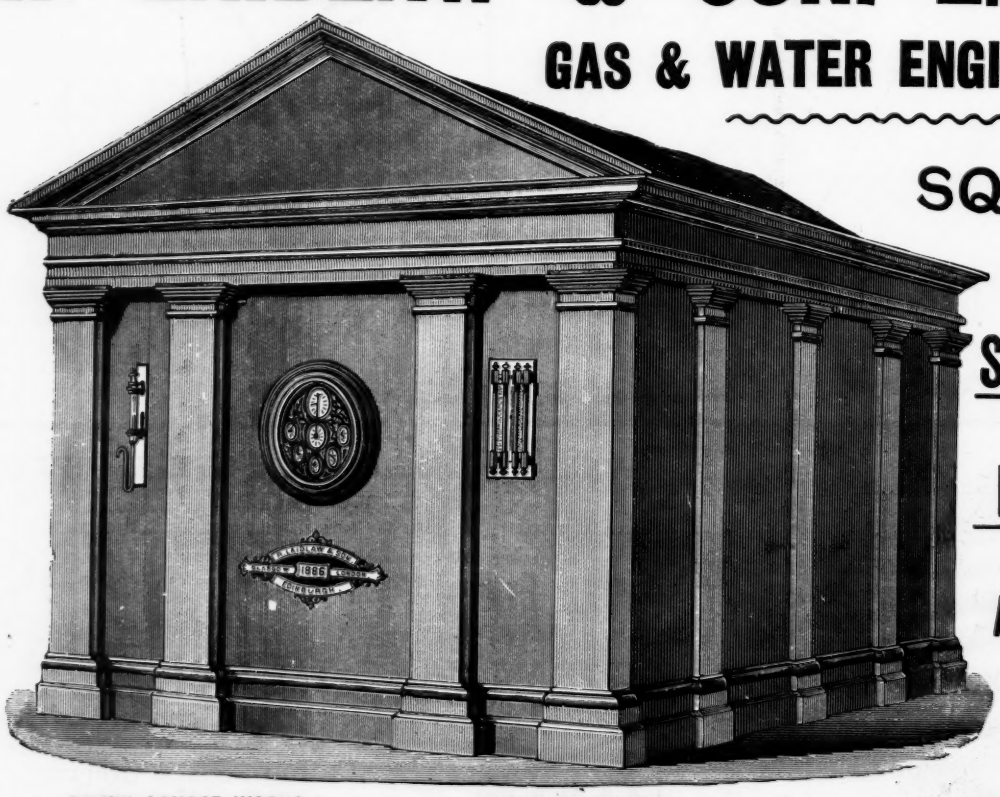

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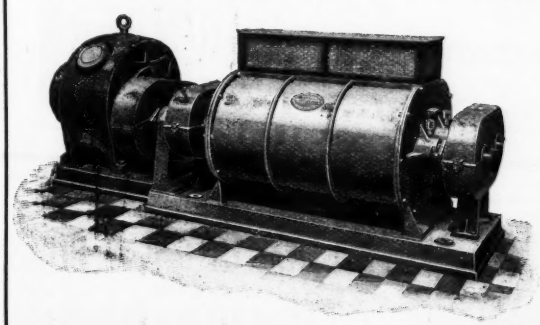
3 gallons Tar and 20 lbs. Coke produce 1000 cubic feet 10 to 12 Candle Power Gas of the following composition—

Hydrogen	64·4 per cent.
Methane	12·0 „ „
Unsaturated Hydrocarbons	3·0 „ „
Carbon Monoxide	15·0 „ „
Nitrogen and Carbon Dioxide	5·6 „ „
	100·0
Calorific Value	400 B.T.U.

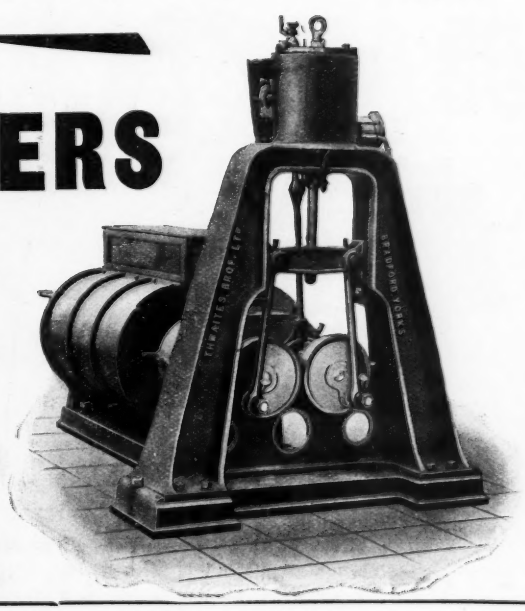
See **Prof. VIVIAN B. LEWES'S** Lecture before Society of Arts, reported in the "JOURNAL OF GAS LIGHTING," Dec. 9, 1902.

THWAITES BROS., LD.,



MECHANICAL ENGINEERS,

BRADFORD.



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Machine-Made Retorts,

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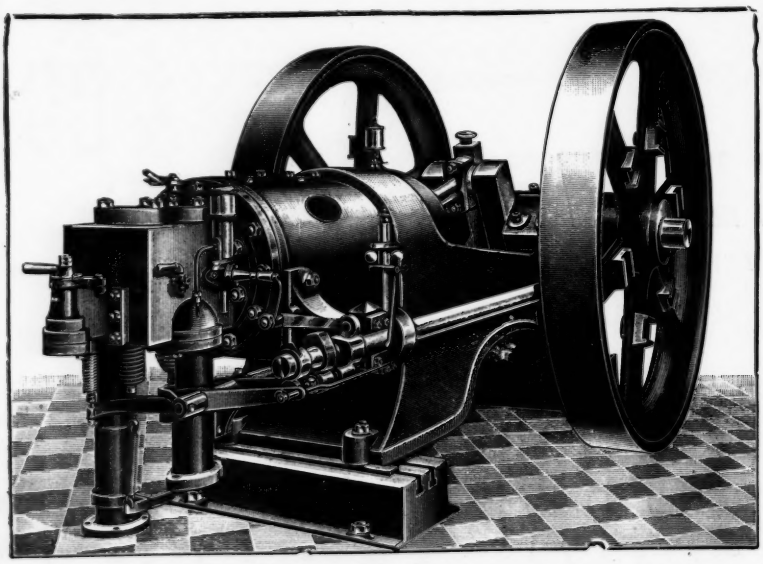

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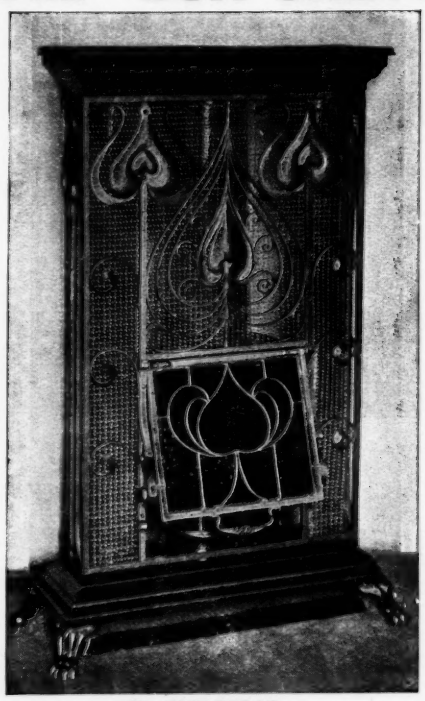

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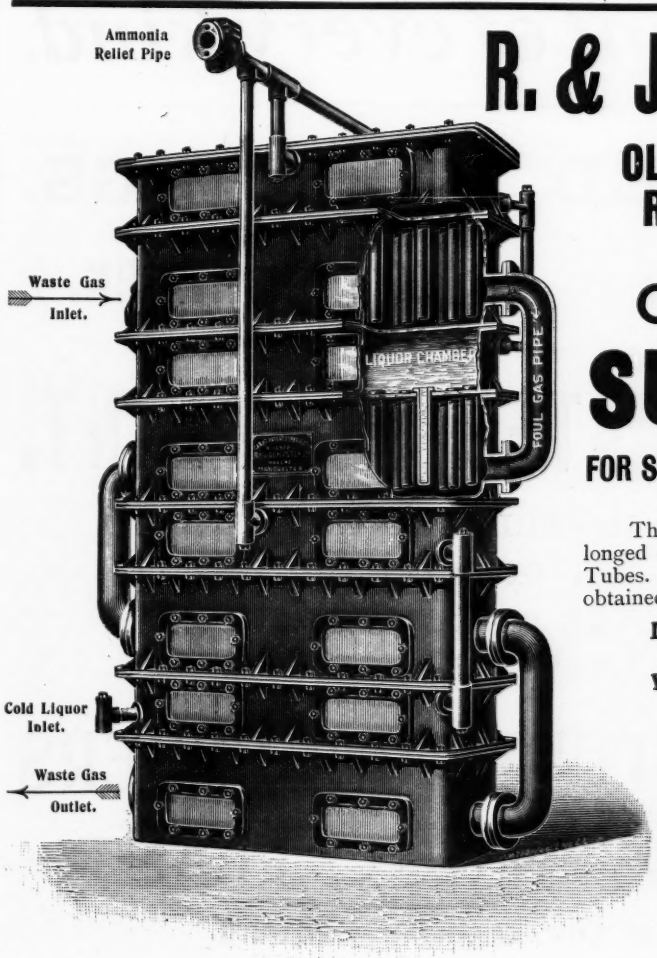

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